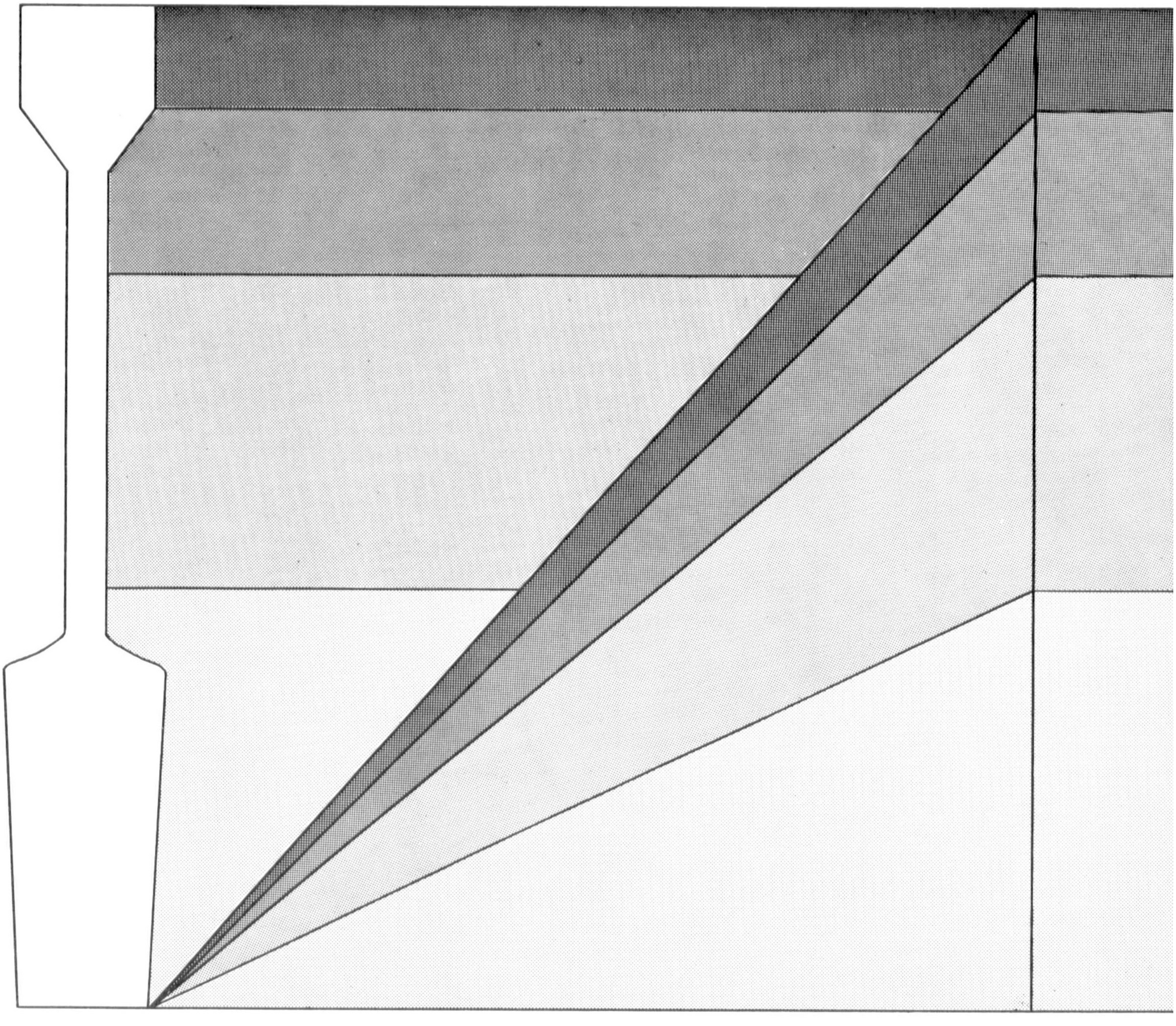
Soil survey of

AURORA COUNTY SOUTH DAKOTA

United States Department of Agriculture
Soil Conservation Service
in cooperation with
South Dakota Agricultural Experiment Station



HOW TO USE

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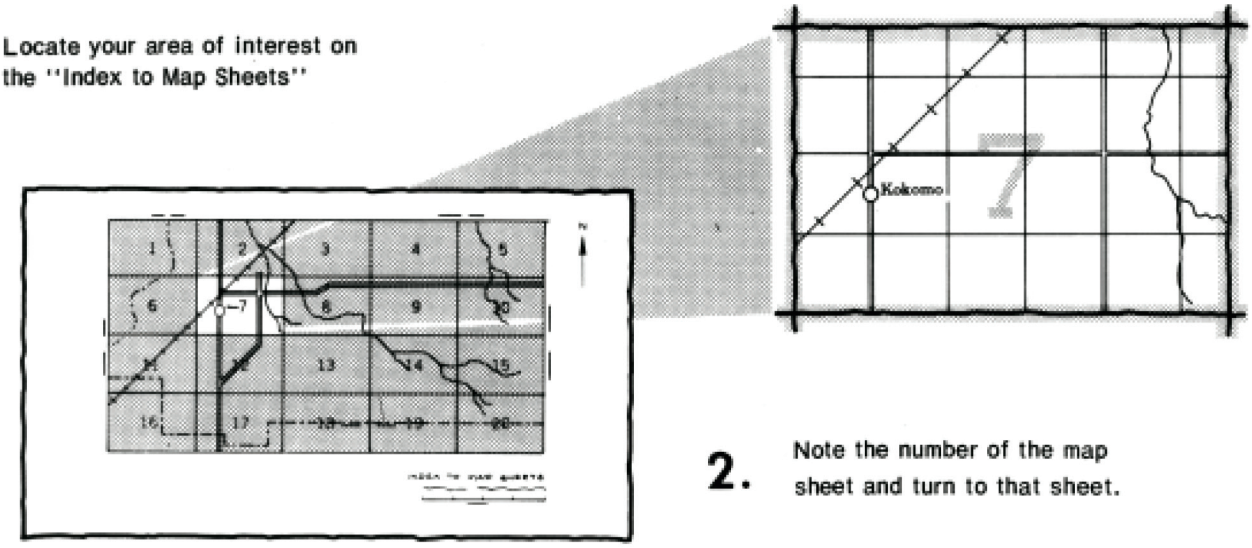

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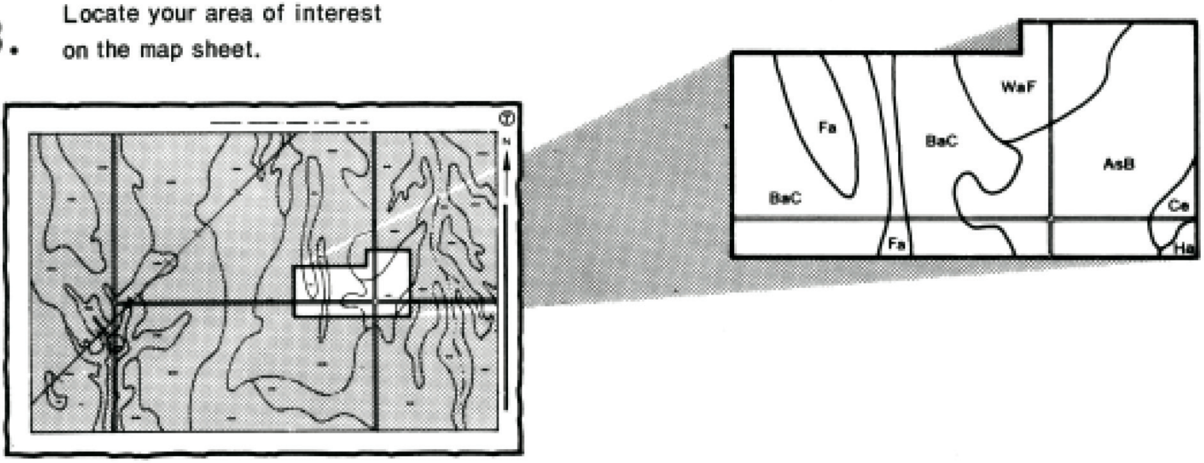

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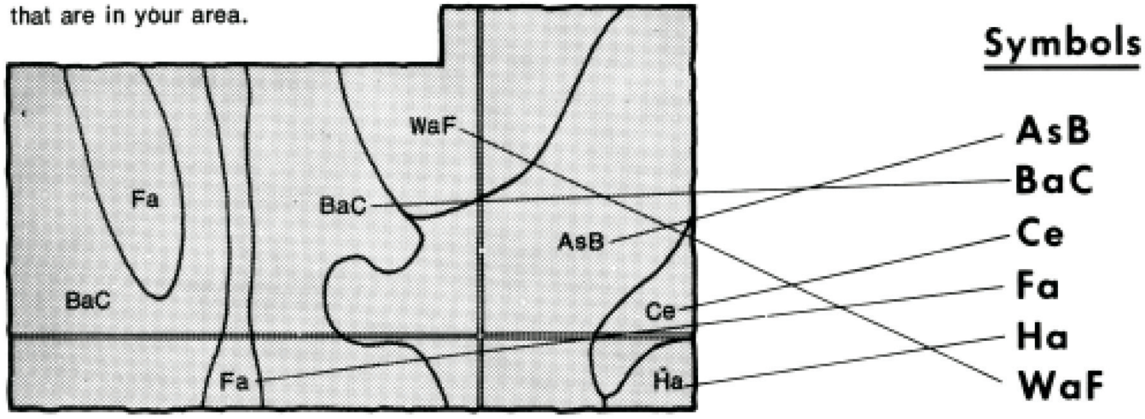
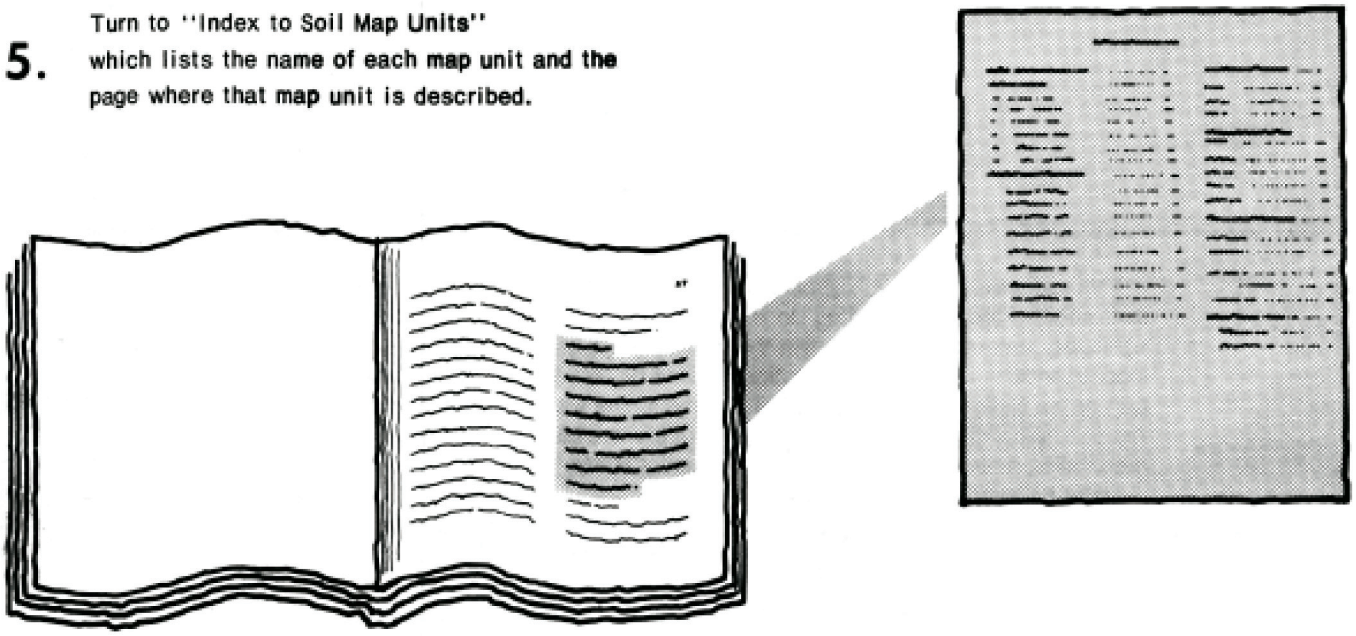
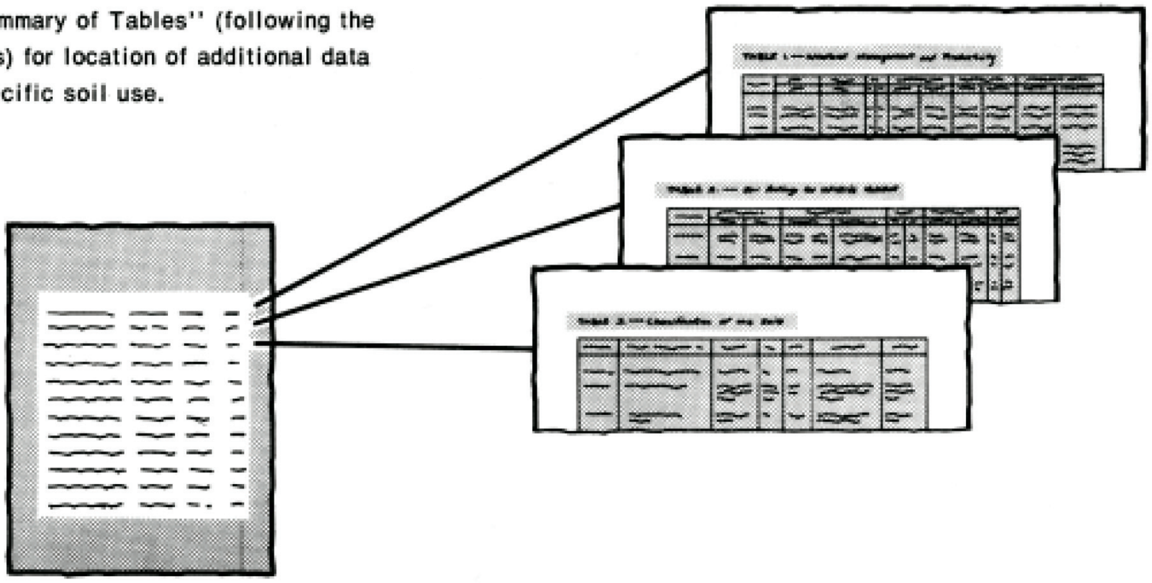


THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

This survey was made cooperatively by the Soil Conservation Service and the South Dakota Agricultural Experiment Station. It is part of the technical assistance furnished to the Aurora County Conservation District. Financial assistance was furnished by the South Dakota Department of Revenue, the Aurora County Commissioners, and the Old West Regional Commission. Major fieldwork was performed in the period 1975 to 1979. Soil names and descriptions were approved in 1979. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1979.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

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foreword

This soil survey contains information that can be used in land-planning programs in Aurora County, South Dakota. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations inherent in the soil or hazards that adversely affect the soil, improvements needed to overcome the limitations or reduce the hazards, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

R. D. Swenson

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soil survey of
Aurora County, South Dakota

By Richard L. Schlepp, Soil Conservation Service

Soils surveyed by Richard L. Schlepp, David M. Rocklitz,
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United States Department of Agriculture, Soil Conservation Service,
in cooperation with South Dakota Agricultural Experiment Station

AURORA COUNTY is in the southeastern part of South Dakota (fig. 1). It has a total area of 458,240 acres, which includes about 4,225 acres of water. Plankinton is the county seat. Other towns and communities are Stickney, White Lake, Aurora Center, and Storla.

More than half of the acreage is cropland, and about 42 percent supports native grass (*3*). Corn, oats, grain sorghum, smooth bromegrass, and alfalfa are the main crops. Farming is diversified; livestock is the main source of income, but income from cash crops also is important.

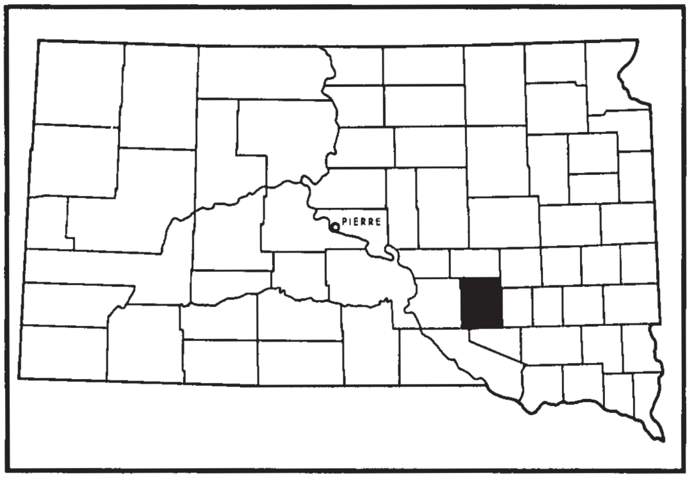

Figure 1.—Location of Aurora County in South Dakota.

general nature of the county

This section gives general information concerning the county. It describes climate, physiography and relief, settlement, farming, and natural resources.

climate

Prepared by the National Climatic Center, Asheville, North Carolina.

Aurora County is usually warm in summer, but frequent hot spells and occasional cool days are characteristic. Temperatures are very cold in winter, when arctic air frequently surges over the area. Most of the precipitation falls during the warm period, especially late in spring and early in summer. Snowfall is normally not too heavy, and it is blown into drifts, so that much of the ground is free of snow.

Table 1 gives data on temperature and precipitation for the survey area as recorded at White Lake, South Dakota, in the period 1951 to 1977. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 20 degrees F, and the average daily minimum temperature is 9 degrees. The lowest temperature on record, which occurred at White Lake on January 19, 1970, is -32 degrees. In summer the average temperature is 73 degrees, and the average daily maximum temperature is 87 degrees. The highest recorded temperature, which occurred at White Lake on June 6, 1976, is 110 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 21.44 inches. Of this, 16 inches, or 75 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 13 inches. The heaviest 1-day rainfall during the period of record was 3.66 inches at White Lake on August 27, 1961. Thunderstorms occur on about 44 days each year, and most occur in summer.

Average seasonal snowfall is 32 inches. The greatest snow depth at any one time during the period of record was 27 inches. On an average of 21 days, at least 1 inch of snow is on the ground. The number of such days varies greatly from year to year. Blizzards occur several times each winter.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 75 percent of the time possible in summer and 55 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 13 miles per hour, in spring.

physiography and relief

Most of Aurora County is in the James River Basin. The landscape is a nearly level and gently undulating glacial till plain where many small drainageways terminate in depressions. There is a gentle overall slope to the northeast. This area is drained by Firesteel Creek.

The extreme northwest part of the county and the southern part are on the Missouri Coteau. The landscape occurs as end moraines of the Mankato Substage of Wisconsin Glaciation (*4*). The "Wessington Hills" in the northwest part are steep and are cut by many narrow drainageways. The southern part is undulating and rolling. It is drained by Platte Creek.

Elevation ranges from 1,329 feet above sea level in the northeastern part of the county to 2,004 feet in the "Wessington Hills."

settlement

Aurora County is named after the Roman goddess of dawn. In the days of the early settlers, a women's literary club proposed this name because it hoped that free homesteading would bring the dawn of a new era. The first permanent settler homesteaded along the upper part of Firesteel Creek in 1879.

The county was established by the Territorial Legislature in 1879 and organized on August 29, 1881. The original county included its present area plus the eastern part of Jerauld County. In November 1882, Plankinton was made the county seat. The population of the county was 5,045 by 1890 and peaked at 7,246 in 1920. It declined to 4,183 by 1970. Plankinton has a population of 613, Stickney has one of 421, and White Lake has one of 395.

Railroads have served the county since the early 1880's. U.S. Highway 281 and Interstate 90 are the main highways. Roads are on almost every section line. Many have an asphalt surface or are gravel roads. Most rural areas are served by all-weather roads to centers of trade.

farming

Farming is the principal enterprise in Aurora County. About 75 percent of the total income is from the sale of livestock and livestock products. In 1974, farmland totaled 410,400 acres, which is about 90 percent of the total acreage. The 570 farms and ranches in the county had an average size of 720 acres (*5*). The average size has gradually increased since the mid 1930's.

According to the South Dakota Crop and Livestock Reporting Service, 52,100 acres was planted to corn in 1977. The corn from 11,500 of these acres was harvested for silage. The rest was harvested for grain. Oats was planted on 48,400 acres, sorghum on 14,000 acres, barley on 10,300 acres, and wheat on 6,800 acres. Tame grasses and alfalfa were grown for hay and pasture on about 68,700 acres. Many of the crops grown in the county are used as feed for livestock.

Most cropped areas are dry-farmed, but a few areas are irrigated. The dominant cropping system is one in which row crops and small grain are grown in rotation with legumes.

natural resources

Soil is the most important natural resource in Aurora County. It provides a growing medium for crops and for the grass grazed by livestock. Other natural resources are ground water and sand and gravel.

The principal source of water for domestic use and for livestock is shallow wells. Deep wells, drilled to a depth of 650 to 1,150 feet, also provide a source of water. Water quantity generally is greater in the deep wells, but the quality is poor because of a high content of soluble salts. Dugouts in areas of Arlo, Durrstein, Hoven, Plankinton, Tetonka, and Worthing soils provide additional water for livestock and wildlife. In some areas underground water of good quality is available in sufficient volume for irrigation.

Significant deposits of sand and gravel are along the major drainageways in the county. These deposits consist mainly of fine to coarse sand and some gravel, silt, and clay. Because of an excessive amount of fine rock fragments, such as shale, chalk, and clay ironstone, the sand and gravel is unsuitable as concrete aggregate or as construction material. It is suitable, however, as subgrade material for roads and as bituminous aggregate.

how this survey was made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; and the kinds of rock. They dug many holes to study soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map units" and "Detailed soil map units."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers, rangeland and woodland managers, engineers, planners, developers and builders, home buyers, and others.

general soil map units

The general soil map at the back of this publication shows the soil associations in this survey area. Each association has a distinctive pattern of soils, relief, and drainage. Each is a unique natural landscape. Typically, an association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one association can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The 10 associations in this county have been grouped for broad interpretive purposes. The associations and the groups are described on the pages that follow. The names of some of the associations do not agree with those on the general soil maps in the published soil surveys of adjacent Davison, Jerauld, and Sanborn Counties. The names do not fully agree because of differences in the detail of the general soil maps and because of changes in the application of the soil classification system.

well drained to poorly drained soils in swales, depressions, and other areas on uplands

These soils dominantly are level to gently rolling but are steeper along some drainageways. They are loamy and silty. They make up about 82 percent of the county. About 57 percent of the acreage is used for cultivated crops or for tame pasture and hay. Alfalfa, corn, oats, and grain sorghum are the main crops.

1. Clarno-Prosper-Plankinton association

Well drained, moderately well drained, and poorly drained, dominantly level to undulating, loamy and silty soils on broad flats and rises and in swales, depressions, and drainageways on uplands

This association is on uplands that are characterized by many swales and depressions. Slopes generally are level to undulating but are steeper along the entrenched drainageways. In most areas the drainageways terminate in small depressions. The drainage pattern is poorly defined in those areas, but it is well defined along the larger drainageways.

This association makes up about 7 percent of the county. It is about 55 percent Clarno soils, 20 percent Prosper soils, 10 percent Plankinton soils, and 15 percent minor soils.

The well drained Clarno soils are on broad flats and on rises. Slopes dominantly are 0 to 6 percent but range to 9 percent along drainageways. Typically, the surface layer is dark grayish brown loam. The subsoil is dark grayish brown and grayish brown, friable loam over pale yellow, calcareous, friable loam. The underlying material is pale yellow, calcareous loam.

The moderately well drained Prosper soils are in swales and poorly defined drainageways. Slopes are less than 2 percent. Typically, the surface layer is dark gray loam. The subsurface layer is dark grayish brown loam. The subsoil is dark grayish brown and grayish brown, friable clay loam over light brownish gray, friable, calcareous clay loam. The underlying material is light gray, calcareous clay loam.

The poorly drained Plankinton soils are in depressions. Slopes are less than 1 percent. Typically, the surface layer is dark gray silt loam. The subsurface layer is light gray silt loam. The subsoil is dark gray, firm silty clay over dark gray and grayish brown, calcareous silty clay loam. The underlying material is light gray and light yellowish brown, calcareous clay loam.

Minor in this association are Betts soils on the higher ridges and slope breaks along entrenched drainageways and Blendon soils in positions on the landscape similar to those of the Clarno soils. The Betts soils have a thin surface layer. The subsoil of the Blendon soils contains more sand than that of any of the major soils.

About 90 percent of this association is used for cultivated crops or for pasture and hay. Corn, small grain, grain sorghum, and alfalfa are the main crops. Some of the steeper areas bordering the larger drainageways are range and are used for grazing and hay. Conserving moisture in all of the major soils and controlling erosion on the more sloping soils are the main concerns of management.

This association is well suited to cultivated crops and to tame pasture and hay, range, and openland wildlife habitat. The Clarno soils are suitable as sites for most sanitary facilities. They also are suitable as sites for most buildings, but they are limited by a moderate shrink-swell potential. The Prosper and Plankinton soils generally are unsuitable as sites for buildings and most sanitary facilities because they are subject to flooding or ponding.

2. Houdek-Prosper association

Well drained and moderately well drained, dominantly nearly level and undulating, loamy soils on broad flats and rises and in swales and drainageways on uplands

This association is on uplands characterized by many swales. Slopes generally are nearly level and undulating but are steeper along entrenched drainageways. The drainage pattern is poorly defined in most areas where drainageways terminate in small depressions, but it is well defined along the larger drainageways.

This association makes up about 9 percent of the county. It is about 45 percent Houdek soils, 25 percent Prosper soils, and 30 percent minor soils.

The well drained Houdek soils are on broad flats and on rises. Slopes dominantly are 0 to 6 percent but range to 9 percent along drainageways. Typically, the surface layer is dark grayish brown loam. The subsoil is grayish brown and light brownish gray, friable clay loam. It is calcareous in the lower part. The underlying material is pale yellow, calcareous clay loam.

The moderately well drained Prosper soils are in swales and poorly defined drainageways. Slopes are less than 2 percent. Typically, the surface layer is dark gray loam. The subsurface layer is dark grayish brown loam. The subsoil is dark grayish brown, grayish brown, and light brownish gray, friable clay loam. It is calcareous in the lower part. The underlying material is light gray, calcareous clay loam.

Minor in this association are the well drained Betts and Ethan soils on the higher ridges and slope breaks along entrenched drainageways; the moderately well drained Dudley soils, which have a sodium affected subsoil and are on concave side slopes; and the poorly drained Hoven, Plankinton, and Tetonka soils in depressions.

About 80 percent of this association is cropland. Corn, small grain, grain sorghum, and alfalfa are the main crops. Some of the steeper areas along the larger drainageways support native grass and are used for grazing or hay. Conserving moisture in all areas and controlling erosion in the more sloping areas are the main concerns of management if these soils are cropped.

This association is well suited to cultivated crops, to tame pasture and hay, to range, and to openland wildlife habitat. The Houdek soils are suitable as sites for buildings and sanitary facilities, but a moderate shrink-swell potential is a limitation on building sites and restricted permeability is a limitation in septic tank absorption fields. The Prosper soils generally are unsuited to building site development and most sanitary facilities because they are subject to flooding.

3. Houdek-Ethan association

Well drained, dominantly undulating to rolling, loamy soils on uplands

This association is on uplands that are characterized by a few swales and depressions. Slopes generally are undulating to rolling but are steeper along entrenched drainageways and are more nearly level in other areas. The drainage pattern is well defined in most areas, but it is poorly defined in areas where drainageways terminate in depressions.

This association makes up about 14 percent of the county. It is about 50 percent Houdek soils, 30 percent Ethan soils, and 20 percent minor soils (fig. 2).

The Houdek soils are on the sides of ridges and knolls. Slopes range from 0 to 9 percent. Typically, the surface layer is dark grayish brown loam. The subsoil is grayish brown and light brownish gray, friable clay loam. It is calcareous in the lower part. The underlying material is pale yellow, calcareous clay loam.

The Ethan soils are on the tops of ridges and on slope breaks along drainageways. Slopes dominantly are 2 to 15 percent but range to 25 percent along drainageways. Typically, the surface layer is dark grayish brown loam. The subsoil is dark grayish brown and light brownish gray, friable loam. It is calcareous in the lower part. The underlying material is light yellowish brown, calcareous clay loam.

Minor in this association are Betts soils in positions on the landscape similar to those of the Ethan soils; the moderately well drained Bon soils on flood plains; the moderately well drained Dudley soils on concave side slopes; the moderately well drained Prosper soils in swales and drainageways; and the poorly drained Hoven, Plankinton, and Tetonka soils in depressions. The Betts soils have a thin surface layer.

About 55 percent of this association is cropland. Corn, small grain, grain sorghum, and alfalfa are the main crops. Many of the steeper areas support native grass and are are used for grazing or hay. Controlling erosion and conserving moisture are the main concerns of management if these soils are cropped.

This association is well suited to range and to rangeland wildlife habitat. It is fairly well suited to cultivated crops and to tame pasture and hay. It also is fairly well suited to most kinds of building site development and sanitary facilities, but a moderate shrink-swell potential is a limitation on building sites and restricted permeability is a limitation in septic tank absorption fields. Also, the slope is a limitation in the steeper areas.

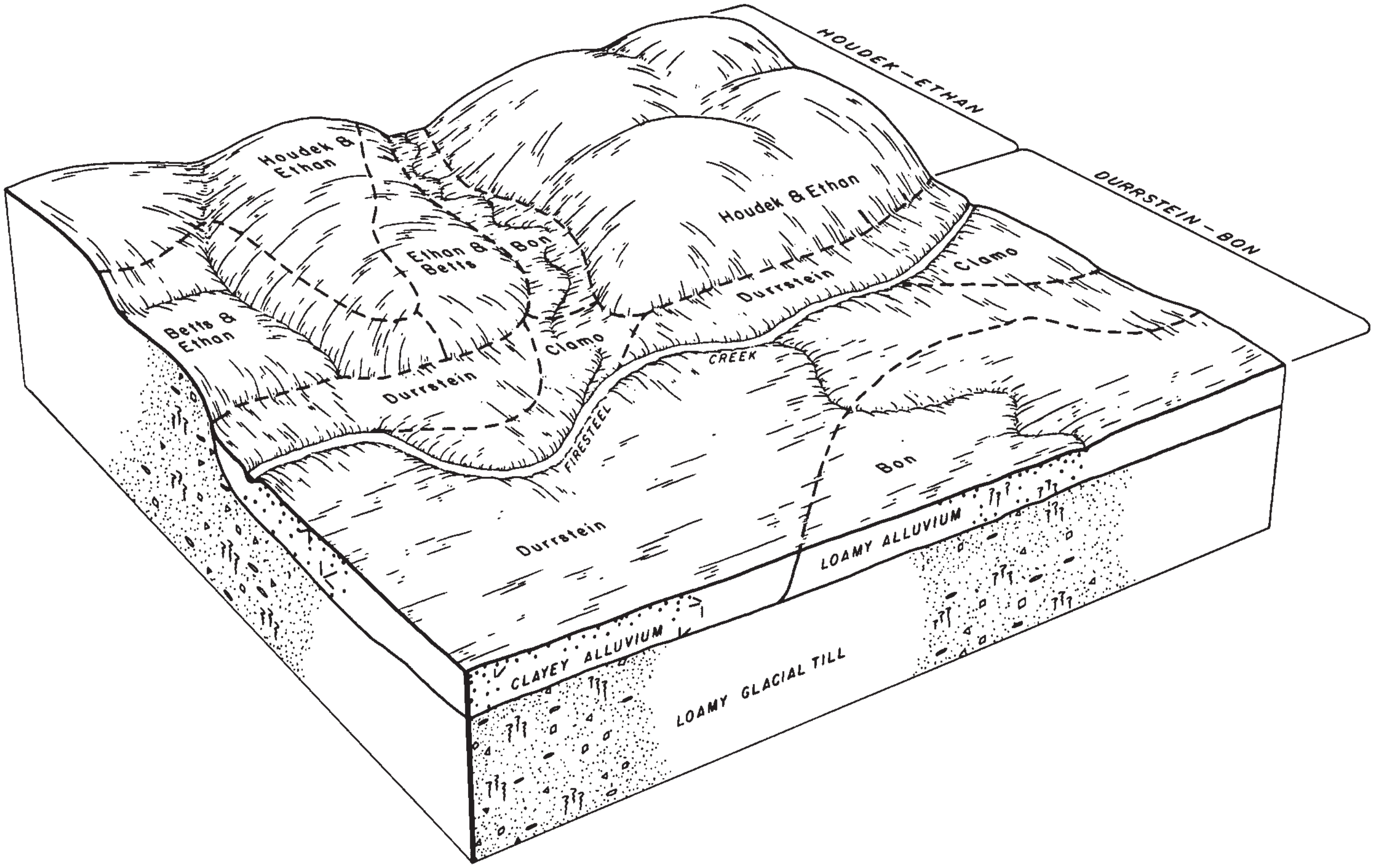

Figure 2.—Pattern of soils and underlying material in the Houdek-Ethan and Durrstein-Bon associations.

4. Houdek-Dudley-Hoven association

Well drained, moderately well drained, and poorly drained, dominantly level to undulating, loamy and silty soils on broad flats, rises, and side slopes and in depressions on uplands

This association is on uplands that are characterized by many swales and depressions. Slopes generally are level to undulating but are steeper along entrenched drainageways. The drainage pattern is poorly defined in most areas where drainageways terminate in small depressions, but it is well defined along the larger drainageways.

This association makes up about 48 percent of the county. It is about 40 percent Houdek soils, 25 percent Dudley soils, 10 percent Hoven soils, and 25 percent minor soils (fig. 3).

The well drained Houdek soils are on broad flats and on rises. Slopes dominantly are 0 to 6 percent but range to 9 percent along drainageways. Typically, the surface layer is dark grayish brown loam. The subsoil is grayish brown and light brownish gray, friable clay loam. It is calcareous in the lower part. The underlying material is pale yellow, calcareous clay loam.

The moderately well drained Dudley soils are on short, concave side slopes. Slopes range from 0 to 6 percent. Typically, the surface layer is dark gray silt loam. The subsurface layer is gray silt loam. The upper part of the subsoil is a claypan of very dark grayish brown and dark grayish brown, very firm clay loam. The lower part is grayish brown, friable, calcareous clay loam. The underlying material is light brownish gray and light yellowish brown, calcareous clay loam.

The poorly drained Hoven soils are in depressions. Slopes are less than 2 percent. Typically, the surface layer is light gray silt loam. The subsoil is a claypan of dark gray, very firm silty clay. The underlying material is light brownish gray, calcareous clay loam.

Minor in this association are the well drained Beadle soils, which contain more clay in the subsoil than the major soils and occur as areas intermingled with areas of the Houdek soils; the well drained Ethan soils, which have lime within a depth of 9 inches and are on ridges and slope breaks; the somewhat poorly drained Jerauld

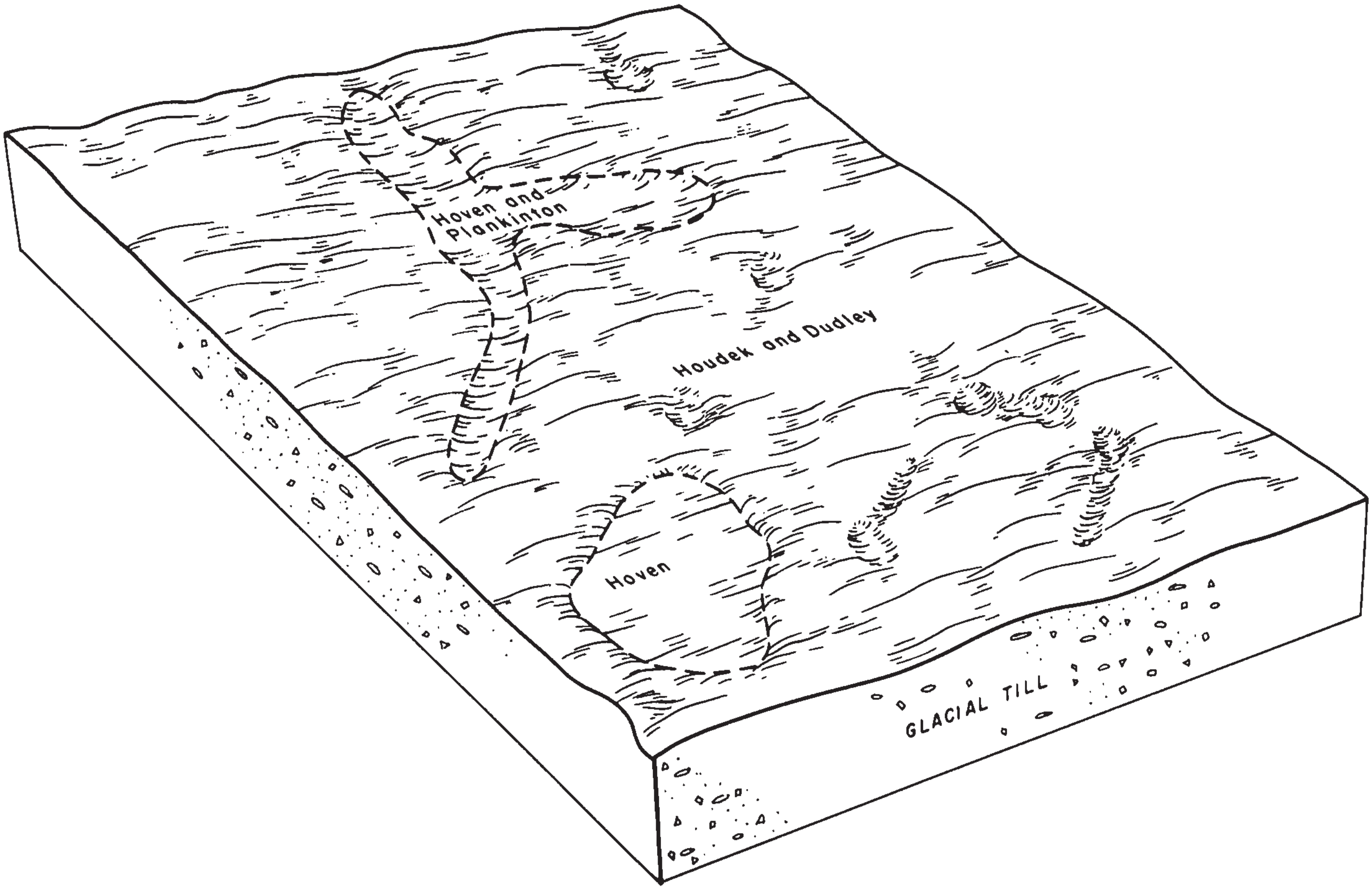

Figure 3.—Pattern of soils and underlying material in the Houdek-Dudley-Hoven association.

soils, which occur as areas intermingled with areas of the Dudley soils; the poorly drained Plankinton soils in depressions; and the moderately well drained Prosper soils, which do not have a sodium affected subsoil and are in swales and drainageways.

About 50 percent of this association is cropland. Corn, small grain, grain sorghum, and alfalfa are the main crops. The steeper areas and the areas where scattered glacial stones are on the surface are used as range. Conserving moisture and improving fertility and tilth in all areas and controlling erosion in the more sloping areas are the main concerns of management.

This association is well suited to range and tame pasture and hay. It is fairly well suited to cultivated crops. The Houdek and Dudley soils are fairly well suited to most kinds of building site development, but they are limited by a moderate shrink-swell potential. The Houdek soils are only fairly well suited and the Dudley soils poorly suited to septic tank absorption fields because of restricted permeability. The Hoven soils generally are unsuitable as sites for buildings and most sanitary facilities because they are subject to ponding.

5. Dudley-Beadle-Jerauld association

Well drained to somewhat poorly drained, nearly level and gently sloping, loamy and silty soils on uplands

This association is on broad flats in the uplands. Slopes generally are nearly level but are steeper along drainageways. The drainage pattern is poorly defined in most areas where drainageways terminate in small depressions, but it is well defined along the larger drainageways.

This association makes up about 4 percent of the county. It is about 30 percent Dudley soils, 15 percent

Beadle soils, 10 percent Jerauld soils, and 45 percent minor soils.

The moderately well drained Dudley soils are on short, concave side slopes. Slopes range from 0 to 6 percent. Typically, the surface layer is dark gray silt loam. The subsurface layer is gray silt loam. The upper part of the subsoil is a claypan of very dark grayish brown and dark grayish brown, very firm clay loam. The lower part is grayish brown, friable, calcareous clay loam. The underlying material is light brownish gray and light yellowish brown, calcareous clay loam.

The well drained Beadle soils are on low rises. Slopes range from 0 to 6 percent. Typically, the surface layer is very dark grayish brown loam. The subsoil is dark grayish brown, firm clay loam and clay over light brownish gray, calcareous, friable clay. The underlying material is light yellowish brown and pale yellow, calcareous clay loam.

The somewhat poorly drained Jerauld soils are on short, concave side slopes and in very shallow depressions. Slopes are less than 3 percent. Typically, the surface layer is gray silt loam. The subsoil is a claypan of dark gray and grayish brown, firm silty clay and clay. In the lower part it is calcareous and contains salts. The underlying material is light brownish gray, calcareous clay loam.

Minor in this association are the well drained Ethan and Houdek soils, which contain less clay in the subsoil than the major soils and are on the higher rises; the poorly drained Hoven and Plankinton soils in depressions; and the moderately well drained Lane and Prosper soils, which do not have a sodium affected subsoil and are on terraces and alluvial fans.

About 65 percent of this association is range. Some areas where the Dudley and Jerauld soils are of minor extent are cultivated. Controlling grazing is the main concern in managing range.

This association is fairly well suited to range, rangeland wildlife habitat, and tame pasture and hay. It is poorly suited to cultivated crops and to openland wildlife habitat. It also is poorly suited to building site development and septic tank absorption fields facilities because a high shrink-swell potential is a limitation on building sites and restricted permeability is a limitation in septic tank absorption fields.

well drained and moderately well drained soils on rises and side slopes and in swales and other areas on uplands

These soils dominantly are nearly level and gently undulating but are steeper in some areas. They are silty and loamy. They make up about 12 percent of the county. About 46 percent of the acreage is used for cultivated crops or for tame pasture and hay. Alfalfa, corn, oats, and grain sorghum are the main crops.

6. Highmore-Onita-DeGrey association

Well drained and moderately well drained, nearly level, silty soils on rises and side slopes and in swales on uplands

This association is on broad flats on uplands that are characterized by many shallow swales. Slopes generally are nearly level but are steeper along drainageways. The drainage pattern is poorly defined in most areas where drainageways terminate in small depressions, but it is well defined along the larger drainageways.

This association makes up about 5 percent of the county. It is about 35 percent Highmore soils, 30 percent Onita soils, 25 percent DeGrey soils, and 10 percent minor soils (fig. 4).

The well drained Highmore soils are on low rises. Slopes range from 0 to 2 percent. Typically, the surface layer is dark grayish brown silt loam. The subsoil is grayish brown and brown, friable silty clay loam over light brownish gray, calcareous silt loam. The underlying material is light brownish gray, calcareous silt loam and clay loam.

The moderately well drained Onita soils are in swales. Slopes range from 0 to 2 percent. Typically, the surface layer is very dark gray silt loam. The subsoil is very dark gray and grayish brown, firm silty clay loam and silty clay. The underlying material is light brownish gray silty clay loam.

The moderately well drained DeGrey soils are on short, concave side slopes. Slopes range from 0 to 3 percent. Typically, the surface layer is dark grayish brown silt loam. The subsurface layer is gray silt loam. The subsoil is dark grayish brown, firm silty clay over light olive brown, calcareous, friable silty clay loam. The underlying material is light yellowish brown and light brownish gray, calcareous silty clay loam over grayish brown, calcareous clay loam.

Minor in this association are the well drained Eakin soils on low knolls; the well drained, loamy Ethan soils on ridges and along drainageways; the somewhat poorly drained Jerauld soils, which occur as areas intermingled with areas of the DeGrey soils; and the poorly drained Hoven and Plankinton soils in depressions. The Eakin soils are underlain by loamy glacial till at a depth of 20 to 40 inches.

About 85 percent of this association is cropland. Corn, small grain, grain sorghum, and alfalfa are the main crops. Some of the steeper areas bordering the larger drainageways support native grass and are used for grazing or hay. Conserving moisture and improving

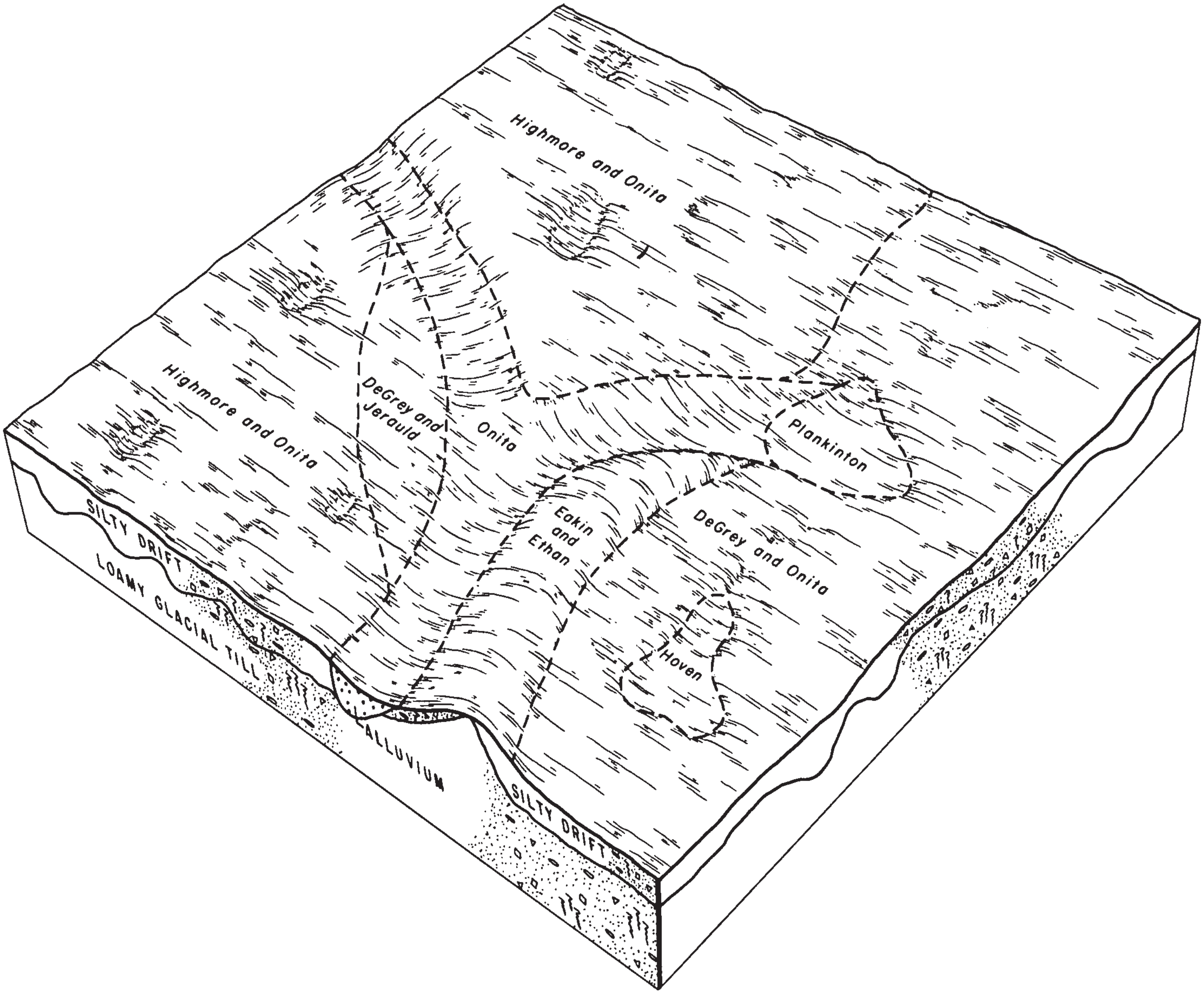

Figure 4.—Pattern of soils and underlying material in the Highmore-Onita-DeGrey association.

fertility are the main concerns of management if these soils are cropped. Improving tilth in the DeGrey soils also is a concern.

This association is well suited to cultivated crops and to openland and rangeland wildlife habitat, tame pasture and hay, and range. The Highmore soils are fairly well suited to building site development, but their moderate shrink-swell potential is a limitation. The DeGrey soils are poorly suited to most kinds of building site development because of a high shrink-swell potential. The Onita soils are poorly suited to building site development because they are subject to flooding. All three soils are poorly suited to septic tank absorption fields because of restricted permeability. Also, flooding is a hazard on the Onita soils.

7. Eakin-DeGrey association

Well drained and moderately well drained, nearly level and gently undulating, silty soils on uplands

This association is on uplands that are characterized by many swales and depressions. Slopes generally are nearly level and gently undulating but are steeper along drainageways. The drainage pattern is poorly defined in most areas where drainageways terminate in small depressions, but it is well defined along the larger drainageways.

This association makes up about 4 percent of the county. It is about 50 percent Eakin soils, 30 percent DeGrey soils, and 20 percent minor soils.

The well drained Eakin soils are on low rises. In this association they have a slope of 0 to 3 percent. Typically, the surface layer is dark grayish brown silt loam. The subsoil is grayish brown and light olive brown, firm silty clay loam over light yellowish brown and light brownish gray, calcareous, friable silt loam. The underlying material is light brownish gray, calcareous clay loam.

The moderately well drained DeGrey soils are on short, concave side slopes. Slopes range from 0 to 3 percent. Typically, the surface layer is dark grayish brown silt loam. The subsurface layer is gray silt loam. The upper part of the subsoil is a claypan of dark grayish brown, firm silty clay. The lower part is light olive brown, calcareous, friable silty clay loam. The underlying material is light yellowish brown and light brownish gray, calcareous silty clay loam over grayish brown, calcareous clay loam.

Minor in this association are the well drained Ethan soils, which have lime within a depth of 9 inches and are on the tops of the higher rises and on slope breaks along the larger drainageways; the poorly drained Hoven and Plankinton soils in depressions; the somewhat poorly drained Jerauld soils, which occur as areas intermingled with areas of the DeGrey soils; and the moderately well drained Onita soils, which do not have a sodium affected subsoil and are in swales.

About 60 percent of this association is range. Some areas are cultivated. Small grain is the main crop. Controlling grazing is the main concern of management.

This association is well suited to range, rangeland wildlife habitat, and tame pasture and hay. It is fairly well suited to cultivated crops. It also is fairly well suited to most kinds of building site development, but it is limited by a moderate shrink-swell potential. The Eakin soils are only fairly well suited and the DeGrey soils poorly suited to septic tank absorption fields because of restricted permeability.

8. Eakin-Ethan association

Well drained, gently sloping to moderately steep, silty and loamy soils on uplands

This association is on uplands that are characterized by a few swales and depressions. Slopes generally are gently sloping to moderately steep. The drainage pattern is well defined in most areas, but it is poorly defined in some areas where drainageways terminate in small depressions.

This association makes up about 3 percent of the county. It is about 45 percent Eakin soils, 25 percent Ethan soils, and 30 percent minor soils.

The Eakin soils are on the mid and lower side slopes. In this association they have a slope of 2 to 6 percent. Typically, the surface layer is dark grayish brown silt loam. The subsoil is grayish brown and light olive brown, firm silty clay loam over light yellowish brown and light brownish gray, friable, calcareous silt loam. The underlying material is light brownish gray, calcareous clay loam.

The Ethan soils are on the tops of ridges and on slope breaks along drainageways. Slopes range from 2 to 25 percent. Typically, the surface layer is dark grayish brown loam. The subsoil is dark grayish brown and light brownish gray, friable loam. It is calcareous in the lower part. The underlying material is light yellowish brown, calcareous clay loam.

Minor in this association are the moderately well drained DeGrey and Onita soils on the concave lower side slopes and in drainageways; the well drained Houdek soils, which formed in glacial till, have carbonates at a depth of 14 inches or more, and either occur as areas intermingled with areas of the Ethan soils or are below those soils on the landscape; and the poorly drained Hoven and Plankinton soils in depressions.

About 70 percent of this association is range, tame pasture, or hayland. Some areas are cultivated. Small grain is the main crop. Controlling grazing is the main concern of management.

This association is well suited to range, rangeland wildlife habitat, and tame pasture and hay. It is fairly well suited to cultivated crops. It also is fairly well suited to most kinds of building site development and sanitary facilities, but the slope, restricted permeability, and moderate shrink-swell potential are limitations.

well drained to excessively drained soils on terraces and uplands

These soils are nearly level to steep. They are loamy. They make up about 4 percent of the county. About 80 percent of the acreage is range.

9. Delmont-Enet-Talmo association

Well drained to excessively drained, nearly level to steep, loamy soils on terraces and uplands

This association is on high terraces and uplands. Slopes generally are nearly level to strongly sloping or rolling but are steeper in some areas. The drainage pattern is poorly defined in most areas.

This association makes up about 4 percent of the county. It is about 40 percent Delmont soils, 25 percent Enet soils, 10 percent Talmo soils, and 25 percent minor soils (fig. 5).

The somewhat excessively drained Delmont soils are on the sides of ridges and on rises. Slopes range from 0 to 25 percent. Typically, the surface layer is dark gray loam. The subsoil is dark gray, very friable loam. The

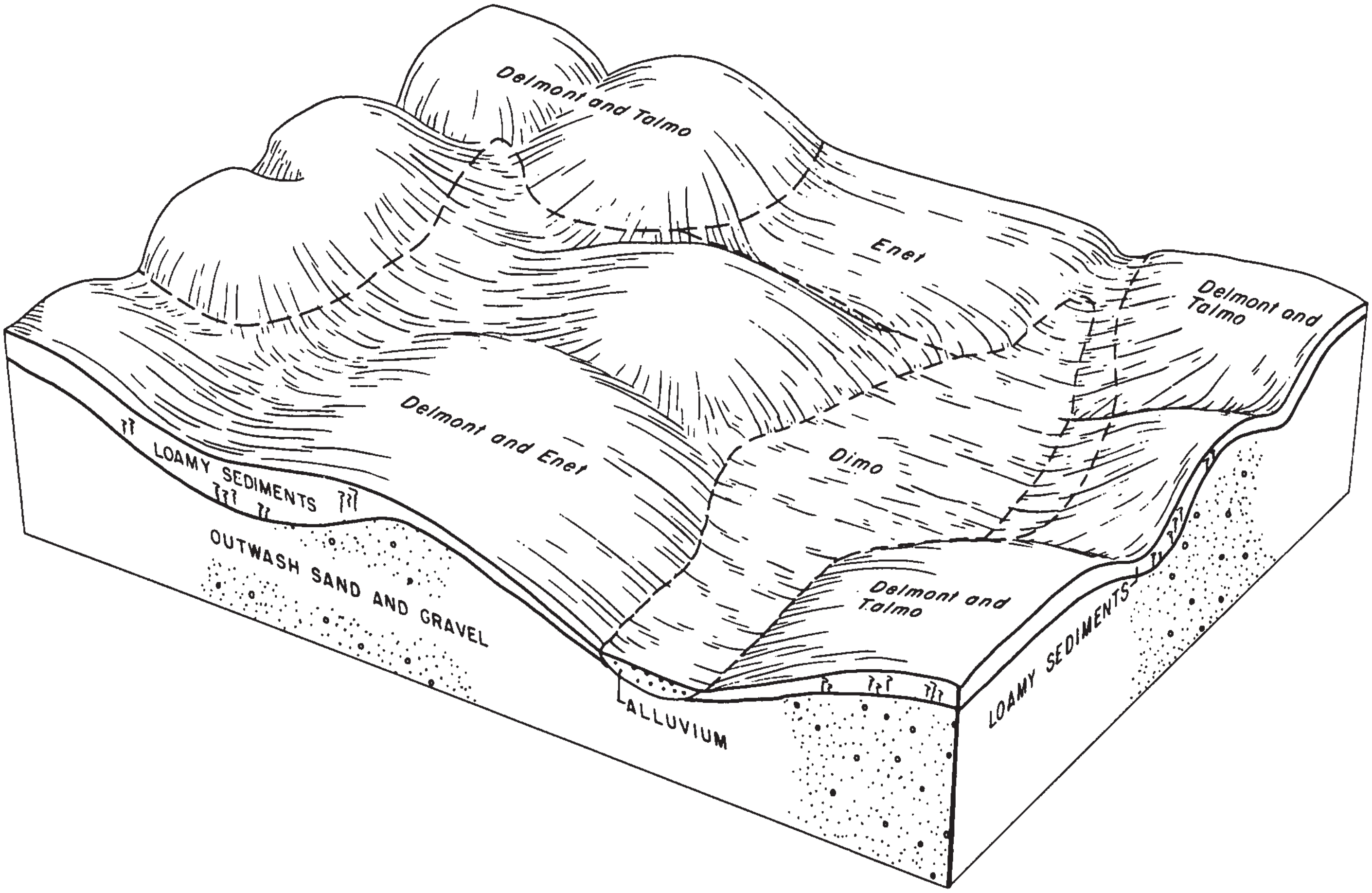

Figure 5.—Pattern of soils and underlying material in the Delmont-Enet-Talmo association.

underlying material is multicolored, calcareous gravelly sand.

The well drained Enet soils have a slope of 0 to 6 percent. Typically, the surface layer is dark gray loam. The subsoil is dark gray, very friable and friable loam. The underlying material is light brownish gray, calcareous gravelly sand over multicolored, stratified sand and gravel.

The excessively drained Talmo soils are on ridgetops and along the larger drainageways. Slopes range from 2 to 40 percent. Typically, the surface layer is very dark gray gravelly loam. The underlying material is multicolored, calcareous gravelly sand.

Minor in this association are the somewhat excessively drained Alwilda soils; the well drained Blendon soils, which occur as areas intermingled with areas of the Enet soils; the very poorly drained Arlo and Worthing and poorly drained Plankinton and Tetonka soils in depressions; and the somewhat poorly drained Dimo soils in swales. The Alwilda and Blendon soils contain more sand in the subsoil than the Enet soils.

About 80 percent of this association is range. Some of the nearly level areas are cultivated. A few areas are irrigated. Controlling erosion is the main concern of management.

This association is fairly well suited to range. The Delmont soils are fairly well suited to tame pasture and hay and are poorly suited to cultivated crops and to wildlife habitat. The Enet soils are well suited to tame pasture and hay and to rangeland wildlife habitat. They are fairly well suited to cultivated crops. The Talmo soils are poorly suited to tame pasture and hay and wildlife habitat. They generally are unsuited to cultivated crops. All three soils are well suited to most kinds of building site development. They are poorly suited to sanitary facilities because the effluent can seep through the sandy and gravelly underlying material and pollute shallow ground water.

poorly drained and moderately well drained soils on flood plains

These soils are nearly level and are silty and loamy. They make up about 2 percent of the county. About 85 percent of the acreage is range.

10. Durrstein-Bon association

Poorly drained and moderately well drained, nearly level, silty and loamy soils on flood plains

This association is on flood plains that are dissected by narrow stream channels. Slopes generally are nearly level but are steeper along the smaller drainageways. The drainage pattern is well defined.

This association makes up about 2 percent of the county. It is about 50 percent Durrstein soils, 35 percent Bon soils, and 15 percent minor soils (fig. 2).

The poorly drained Durrstein soils are on broad flats and in swales. Slopes are less than 1 percent. Typically, the surface layer is gray silt loam. The subsoil is dark gray and gray, firm clay loam and silty clay. The underlying material is grayish brown, light brownish gray, gray, and light olive gray, calcareous silty clay.

The moderately well drained Bon soils are on rises and near stream channels. Slopes are less than 2 percent. Typically, the surface layer is dark grayish brown loam. The subsurface layer is dark grayish brown, dark gray, and gray, calcareous loam. The underlying material is grayish brown and pale brown, calcareous loam.

Minor in this association are the very poorly drained Arlo soils, which are moderately deep to gravelly loamy sand and are in depressions; the poorly drained Clamo soils, which occur as areas intermingled with areas of the Durrstein soils; and the moderately well drained Prosper soils, which typically have a clay loam subsoil and are in swales on uplands.

About 85 percent of this association is range. A few areas of the Bon soils are pastured or cultivated. Frequent flooding is the main concern of management.

This association is fairly well suited to range and to rangeland wildlife habitat. It is poorly suited to cultivated crops and to openland wildlife habitat. It generally is unsuitable as a site for buildings and sanitary facilities because of the flooding.

detailed soil map units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and management of the soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and identifies the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Beadle loam, 0 to 3 percent slopes, is one of several phases in the Beadle series.

Some map units are made up of two or more major soils. These map units are called soil complexes. A *soil complex* consists of two or more soils that occur as areas so intricately mixed or so small that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Plankinton-Prosper complex is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. These dissimiliar soils are described in each map unit. Also, some of the more unusual or strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes some *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits, gravel, is an example. Some miscellaneous areas are large enough to be delineated on the soil maps. Some that are too small to be delineated are identified by a special symbol on the soil maps.

The names of some map units delineated on the detailed maps of this county do not fully agree with those delineated on the maps in the soil surveys of adjacent Davison, Jerauld, and Sanborn Counties. Differences result from variations in the design and composition of map units or from changes in the application of the soil classification system.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

soil descriptions

AaA—Alwilda loam, 0 to 2 percent slopes. This somewhat excessively drained, nearly level soil is on high stream terraces and on uplands. It is moderately deep over gravelly sand and sand. Areas are 10 to 100 acres in size and are irregular in shape. Slopes are smooth or slightly convex.

Typically, the surface layer is very dark gray loam about 6 inches thick. The subsurface layer is very dark gray fine sandy loam about 4 inches thick. The subsoil is about 19 inches thick. It is very dark gray and dark grayish brown, very friable sandy loam over light brownish gray, calcareous loamy sand. The upper part of the underlying material is light brownish gray, calcareous gravelly sand. The lower part to a depth of 60 inches is multicolored, calcareous sand. In some cultivated areas the surface layer is fine sandy loam. In some areas loam or clay loam glacial till is below a depth of 40 inches. In places the subsoil contains more clay.

Included with this soil in mapping are small areas of Delmont, Dimo, Enet, Plankinton, and Tetonka soils. These soils make up less than 15 percent of any one mapped area. Delmont, Dimo, and Enet soils contain more clay in the subsoil than the Alwilda soil. Delmont soils are on the slightly higher ridges. Dimo and Enet soils are in positions on the landscape similar to those of the Alwilda soil. The poorly drained Plankinton and Tetonka soils are in depressions.

The Alwilda soil is medium in fertility and moderate in content of organic matter. Available water capacity is low. Permeability is moderately rapid in the subsoil and rapid in the underlying material. Runoff is slow.

Most of the acreage is cropland. This soil is only fairly well suited to cultivated crops because it is droughty and is subject to soil blowing. Stubble mulching, crop residue management, and minimum tillage help to control soil blowing, conserve moisture, and increase the content of organic matter. Applying fertilizer improves fertility.

A cover of tame pasture plants or hay helps to control soil blowing. This soil is well suited to tame pasture and hay. Alfalfa, crested wheatgrass, intermediate wheatgrass, and smooth bromegrass grow well.

This soil is suited to windbreaks and environmental plantings. Optimum survival, growth, and vigor are not likely, however, because of the droughtiness.

This soil is well suited to range. The native vegetation dominantly is bluestems and prairie sandreed. Overused areas are dominated by prairie sandreed, needleandthread, western wheatgrass, and sideoats grama. After continued overuse, Kentucky bluegrass, blue grama, and weeds dominate the site.

This soil is well suited to most kinds of building site development, but the sides of shallow excavations tend to cave in unless they are shored. Septic tank absorption fields can function in this soil, but the effluent can pollute shallow ground water. The soil is a probable source of gravelly sand for use as road construction material.

The capability subclass is IIIe; Sandy range site.

Ar—Arlo loam. This very poorly drained, nearly level soil is in depressions and drainageways that are frequently flooded by runoff from adjacent uplands. It is moderately deep over gravelly loamy sand. Areas are 5 to 80 acres in size and are irregular in shape. Slopes are short and are smooth or concave.

Typically, the surface layer is very dark gray, calcareous loam about 7 inches thick. The next 8 inches is gray and dark gray, friable, calcareous clay loam. The upper part of the underlying material, to a depth of about 28 inches, is gray and light gray, calcareous clay loam and loam. The lower part to a depth of 60 inches is light brownish gray and grayish brown, calcareous gravelly loamy sand. In places the surface layer is overlain by a thin layer of organic material.

Included with this soil in mapping are small areas of Bon, Delmont, Dimo, Durrstein, and Enet soils. These soils make up less than 15 percent of any one mapped area. Bon soils are moderately well drained. Delmont soils are somewhat excessively drained. Dimo soils are somewhat poorly drained. Durrstein soils have a sodium affected subsoil. Enet soils are well drained. All of the included soils are slightly higher on the landscape than the Arlo soil.

The Arlo soil is medium in fertility and moderate in content of organic matter. Available water capacity is moderate. Permeability is moderate in the surface layer and rapid in the underlying material. A high water table is within a depth of 2 feet in the spring of most years. Runoff is slow.

Most areas support native grass. This soil is fairly well suited to range and is suited to tame pasture and hay. The native vegetation dominantly is prairie cordgrass and appreciable amounts of sedges and forbs. Overused areas are dominated by sedges, inland saltgrass, and Kentucky bluegrass. Garrison creeping foxtail and reed canarygrass are suitable for planting on tame pasture. Many areas are potential sites for stock water ponds.

This soil generally is too wet for cultivated crops, windbreaks and environmental plantings, building site development, and sanitary facilities.

The capability subclass is Vw; Wetland range site.

BaA—Beadle loam, 0 to 3 percent slopes. This deep, well drained, nearly level soil is on uplands. In some areas scattered glacial stones are on the surface. Areas are 5 to 200 acres in size and are irregular in shape. Slopes generally are smooth.

Typically, the surface layer is very dark grayish brown loam about 6 inches thick. The subsoil is about 25 inches of dark grayish brown and light brownish gray, firm clay loam and clay. It is firm in the upper part and friable and calcareous in the lower part. The underlying material to a depth of 60 inches is light yellowish brown and pale yellow, calcareous clay loam. In some plowed areas the surface layer is clay loam.

Included with this soil in mapping are small areas of Dudley, Houdek, Hoven, Jerauld, Onita, Plankinton, and Prosper soils. These soils make up less than 15 percent of any one mapped area. Dudley and Jerauld soils have a sodium affected subsoil. They are in concave areas. Houdek and Prosper soils contain less clay in the subsoil than the Beadle soil. Houdek soils are on the slightly higher ridges and knolls. Prosper soils are in swales and drainageways. The poorly drained Hoven and Plankinton soils are in depressions. Onita soils are dark to a depth of more than 20 inches. They are in swales.

The Beadle soil is medium in fertility and moderate in content of organic matter. Available water capacity is high. Permeability is moderately slow. Runoff is slow. The shrink-swell potential is high in the subsoil. Tilling when the soil is wet causes compaction of the subsoil.

Most of the acreage is cropland. This soil is well suited to cultivated crops. Improving tilth and conserving moisture are the main concerns of management. Stubble mulching, crop residue management, and mimimum tillage conserve moisture and improve fertility and tilth.

This soil is well suited to tame pasture and hay. Alfalfa, intermediate wheatgrass, and smooth bromegrass grow well.

This soil is fairly well suited to windbreaks and environmental plantings. Most of the climatically suited trees and shrubs grow well.

This soil is well suited to range. The native vegetation dominantly is western wheatgrass and green needlegrass. Overused areas are dominated by western wheatgrass. After continued overuse, the western wheatgrass is replaced by blue grama and less palatable sedges and weeds.

Because of the high shrink-swell potential, this soil is poorly suited to most kinds of building site development. Backfilling with sandy material, providing foundation drains, and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling. Reinforcing foundations and footings also helps to prevent this damage.

Because of the restricted permeability, this soil is poorly suited to septic tank absorption fields. Enlarging the absorption area of these fields helps to overcome the slow absorption of liquid waste.

The capability subclass is IIs; Clayey range site.

BaB—Beadle loam, 3 to 6 percent slopes. This deep, well drained, gently sloping soil is on uplands. In some areas scattered glacial stones are on the surface. Areas are 5 to 300 acres in size and are irregular in shape. Most of the slopes are long and smooth, but some are short and complex.

Typically, the surface layer is very dark grayish brown loam about 6 inches thick. The subsoil is about 25 inches of dark grayish brown and light brownish gray clay loam and clay. It is firm in the upper part and friable and calcareous in the lower part. The underlying material to a depth of 60 inches is light yellowish brown and pale yellow, calcareous clay loam. In some plowed areas the surface layer is clay loam.

Included with this soil in mapping are small areas of Dudley, Ethan, Houdek, Hoven, Jerauld, Onita, Plankinton, and Prosper soils. These soils make up less than 15 percent of any one mapped area. Dudley and Jerauld soils have a sodium affected subsoil. They are in concave areas. Ethan and Houdek soils contain less clay in the subsoil than the Beadle soil. They are on the higher ridges and knolls. The poorly drained Hoven and Plankinton soils are in depressions. Onita and Prosper soils are dark to a depth of more than 20 inches. They are in swales and drainageways.

The Beadle soil is medium in fertility and moderate in content of organic matter. Available water capacity is high. Permeability is moderately slow. Runoff is medium. The shrink-swell potential is high in the subsoil.

About half of the acreage is cropland, and half is range. This soil is fairly well suited to cultivated crops. Controlling erosion, improving tilth, and conserving moisture are the main concerns of management. Stubble mulching, crop residue management, minimum tillage, and grassed waterways help to control erosion, conserve moisture, and improve fertility and tilth. Contour farming and terraces also help to control erosion, but some slopes are too short or irregular for contouring and terracing. Tilling when the soil is wet causes compaction of the subsoil.

This soil is well suited to tame pasture and hay. Alfalfa, intermediate wheatgrass, and smooth bromegrass grow well.

This soil is fairly well suited to windbreaks and environmental plantings. Most of the climatically suited trees and shrubs grow well.

This soil is well suited to range. The native vegetation dominantly is western wheatgrass and green needlegrass. Overused areas are dominated by western wheatgrass. After continued overuse, blue grama and less palatible sedges and weeds dominate the site.

Because of the high shrink-swell potential, this soil is poorly suited to most kinds of building site development. Backfilling with sandy material, providing foundation drains, and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling. Reinforcing foundations and footings also helps to prevent this damage.

Because of the restricted permeability, this soil is poorly suited to septic tank absorption fields. Enlarging the absorption area of these fields helps to overcome the slow absorption of liquid waste.

The capability subclass is IIIe; Clayey range site.

BdA—Beadle-Dudley complex, 0 to 3 percent slopes. These deep, nearly level soils are on uplands. The well drained Beadle soil is in convex areas, and the moderately well drained Dudley soil is in concave areas. In some areas scattered glacial stones are on the surface. Areas are 10 to several hundred acres in size and are irregular in shape. They are 35 to 55 percent Beadle soil and 25 to 45 percent Dudley soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Beadle soil is very dark grayish brown loam about 6 inches thick. The subsoil is about 25 inches of dark grayish brown and light brownish gray clay loam and clay. It is firm in the upper part and friable and calcareous in the lower part. The underlying material to a depth of 60 inches is light yellowish brown and pale yellow, calcareous clay loam. In some plowed areas the surface layer is clay loam.

Typically, the surface layer of the Dudley soil is dark gray silt loam about 7 inches thick. The subsurface layer is gray silt loam about 2 inches thick. The subsoil is very dark grayish brown, dark grayish brown, and grayish brown clay loam about 21 inches thick. It is very firm in the upper part and friable in the lower part. The lower part is calcareous and has nests of gypsum crystals and sodium salts. The underlying material to a depth of 60 inches is light yellowish brown, calcareous clay loam. In some areas the subsurface layer is more than 2 inches thick. In places the subsoil and underlying material are silty clay loam or silty clay.

Included with these soils in mapping are small areas of Houdek, Hoven, Jerauld, Onita, and Plankinton soils. These included soils make up less than 20 percent of any one mapped area. Houdek soils contain less clay in the subsoil than the Beadle and Dudley soils. They are on the slightly higher ridges and knolls. The poorly drained Hoven and Plankinton soils are in depressions. Jerauld soils have sodium salts within a depth of 16 inches. Their position on the landscape is similar to that of the Dudley soil. Onita soils are dark to a depth of more than 20 inches. They are in poorly defined drainageways and in swales.

The Beadle and Dudley soils are medium in fertility and moderate in content of organic matter. Available water capacity is high. Permeability is moderately slow in the Beadle soil and slow in the Dudley soil. The shrink-swell potential is high in the subsoil of both soils. Tilling is difficult on the Dudley soil, and root penetration is restricted by the dense, sodium affected subsoil.

About half of the acreage is cropland, and half is range. These soils are fairly well suited to cultivated crops. The main concerns of management are improving tilth and fertility, increasing the water intake rate, conserving moisture, and increasing the content of organic matter. Crop residue management, minimum tillage, chiseling or subsoiling, and stubble mulching conserve moisture, increase the water intake rate, and improve tilth. Planting green manure crops improves tilth and fertility and increases the content of organic matter.

A cover of tame pasture plants or of hay is effective in improving tilth. These soils are well suited to tame pasture and hay. The best climatically suited tame pasture plants are alfalfa, crested wheatgrass, and intermediate wheatgrass.

These soils are well suited to range. The native vegetation dominantly is green needlegrass and western wheatgrass. Overused areas are dominated by western wheatgrass and less productive short grasses. After continued overuse, saltgrass, blue grama, and weeds occupy areas of the Dudley soil and much of the surface is bare.

These soils are fairly well suited to windbreaks and environmental plantings. Most climatically suited trees and shrubs grow well on the Beadle soil. No trees and shrubs grow well on the Dudley soil; optimum survival and vigor are unlikely.

Because of the high shrink-swell potential, these soils are poorly suited to most kinds of building site development. Backfilling with sandy material, providing foundation drains, and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling. Reinforcing foundations and footings also helps to prevent this damage.

Because of the restricted permeability, these soils are poorly suited to septic tank absorption fields. Enlarging the absorption area of these fields helps to overcome the slow absorption of liquid waste.

The Beadle soil is in capability subclass IIs, Clayey range site; the Dudley soil is in capability subclass IVs, Claypan range site.

BeE—Betts-Ethan loams, 15 to 40 percent slopes. These deep, well drained, moderately steep and steep soils are on ridges and along entrenched drainageways on uplands. The Betts soil is on narrow ridges and the convex upper side slopes. The Ethan soil is on the convex mid and lower side slopes. In some areas scattered glacial stones are on the surface. Areas are 10 to several hundred acres in size and generally are irregular in shape. They are 45 to 65 percent Betts soil and 20 to 35 percent Ethan soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Betts soil is dark grayish brown, calcareous loam about 3 inches thick. The subsoil is light brownish gray, friable, calcareous clay loam about 5 inches thick. The underlying material to a depth of 60 inches is light gray, calcareous clay loam. It has gypsum crystals in the lower part. In places the surface layer is silt loam.

Typically, the surface layer of the Ethan soil is dark grayish brown loam about 5 inches thick. The subsoil is dark grayish brown and light brownish gray, friable loam about 17 inches thick. It is calcareous in the lower part. The underlying material to a depth of 60 inches is light yellowish brown, calcareous clay loam. In places the surface layer is silt loam. In some areas it is calcareous. In other areas carbonates are below a depth of 10 inches.

Included with these soils in mapping are small areas of Eakin, Houdek, and Prosper soils. These included soils make up less than 20 percent of any one mapped area. Houdek soils have carbonates at a depth of more than 12 inches. Eakin soils contain more silt and less sand in the subsoil than the Betts and Ethan soils. Also, they have carbonates at a depth of more than 10 inches. Eakin and Houdek soils are on uplands. Prosper soils are dark to a depth of more than 20 inches. They are in swales.

Fertility and the content of organic matter are low in the Betts and Ethan soils. Available water capacity is high. Permeability is moderate in the subsoil and moderately slow in the underlying material. Runoff is rapid. The shrink-swell potential is moderate.

Most areas support native grass. These soils are fairly well suited to range. The native vegetation dominantly is green needlegrass, little bluestem, sideoats grama, and western wheatgrass. Overused areas are dominated by needleandthread, western wheatgrass, sideoats grama, blue grama, and annual grasses and weeds. Areas along the deeper drainageways are potential sites for stock water impoundments.

These soils generally are too steep for cultivated crops and for tame pasture and hay, windbreaks and environmental plantings, building site development, and most sanitary facilities. Climatically suited trees and shrubs can be established for special purposes if they are planted by hand and given special care.

The Betts soil is in capability subclass VIIe, Thin Upland range site; the Ethan soil is in capability subclass VIe, Silty range site.

BnA—Blendon fine sandy loam, 0 to 3 percent slopes. This deep, well drained, nearly level soil is on uplands. Areas are 5 to 200 acres in size and are irregular in shape. Slopes generally are long and smooth.

Typically, the surface layer is dark gray fine sandy loam about 11 inches thick. The subsoil is dark grayish brown and brown, friable fine sandy loam about 26 inches thick. The upper part of the underlying material is pale brown fine sandy loam. The lower part to a depth of 60 inches is light brownish gray loamy fine sand. In some areas the dark colors extend to a depth of less than 20 inches. In places the underlying material is calcareous or is gravelly sand.

Included in mapping are small areas of Clarno, Delmont, Dimo, Enet, Plankinton, Prosper, and Tetonka soils that make up less than 15 percent of any mapped area. Clarno and Prosper soils have more clay in the subsoil than Blendon soil. They are on the tops of low ridges and in swales where glacial till is near the surface. Delmont, Dimo, and Enet soils are underlain by gravelly sand. Delmont soils are on the slightly higher ridges and knolls. Dimo and Enet soils are similar in position on the landscape to the Blendon soil. The poorly drained Plankinton and Tetonka soils are in depressions.

The Blendon soil is medium in fertility and moderate in content of organic matter. Available water capacity is moderate. Permeability is moderately rapid in the subsoil and rapid in the underlying material. Runoff is slow.

Most of the acreage is cropland. This soil is fairly well suited to cultivated crops. Small grain and grain sorghum are better suited than corn. Controlling soil blowing and conserving moisture are the main concerns of management. Stubble mulching, crop residue management, and minimum tillage help to control soil blowing and conserve moisture. Field windbreaks also help to control soil blowing. Applying fertilizer improves fertility. The soil is well suited to irrigation.

This soil is well suited to windbreaks and environmental plantings. Except for those species that can grow well only if the supply of moisture is high, most climatically suited trees and shrubs grow well.

An adequate cover of tame pasture plants or hay or of ground mulch is effective in controlling soil blowing and conserving moisture. This soil is well suited to tame pasture and hay. Alfalfa, intermediate wheatgrass, and smooth bromegrass are suitable.

This soil is well suited to range. The native vegetation dominantly is bluestems and prairie sandreed. Overused areas are mainly prairie sandreed, needleandthread, western wheatgrass, and sideoats grama. After continued overuse, Kentucky bluegrass, blue grama, and weeds occupy the site.

This soil is well suited to most building site development, but the sides of shallow excavations tend to cave in unless shored. The soil is poorly suited to sanitary facilities. Septic tank absorption fields function adequately, but the effluent can pollute shallow ground water.

The capability subclass is IIIe; Sandy range site.

BnB—Blendon fine sandy loam, 3 to 6 percent slopes. This deep, well drained, gently sloping soil is on uplands. Areas are 5 to 400 acres in size and are irregular in shape. Most of the slopes are long and smooth, but some are short and complex.

Typically, the surface layer is dark gray fine sandy loam about 11 inches thick. The subsoil is dark grayish brown and brown, friable fine sandy loam about 26 inches thick. The upper part of the underlying material is pale brown fine sandy loam. The lower part to a depth of 60 inches is light brownish gray loamy fine sand. In places the dark colors extend to a depth of less than 20 inches. In some areas the underlying material is gravelly sand. In other areas it is calcareous.

Included with this soil in mapping are small areas of Clarno, Delmont, Dimo, Enet, Plankinton, Prosper, and Tetonka soils. These soils make up less than 15 percent of any one mapped area. Clarno and Prosper soils contain more clay in the subsoil than the Blendon soil. Clarno soils are on the tops of the higher ridges, and Prosper soils are in swales. Delmont, Dimo, and Enet soils are underlain by gravelly sand. Delmont soils are on ridges and slope breaks. Dimo and Enet soils are in positions on the landscape similar to those of the Blendon soil. The poorly drained Plankinton and Tetonka soils are in depressions.

The Blendon soil is medium in fertility and moderate in content of organic matter. Available water capacity is moderate. Permeability is moderately rapid in the subsoil and rapid in the underlying material. Runoff is slow.

Most of the acreage is cropland. This soil is fairly well suited to cultivated crops. Small grain and grain sorghum are better suited than corn. Controlling soil blowing and erosion and conserving moisture are the main concerns of management. Stubble mulching, crop residue management, and minimum tillage help to control soil blowing and erosion and conserve moisture. Field windbreaks also help to control soil blowing. Applying fertilizer improves fertility.

This soil is well suited to windbreaks and environmental plantings. Except for those species that can grow well only if the supply of moisture is high, most climatically suited trees and shrubs grow well.

A cover of tame pasture plants or hay or of ground mulch is effective in controlling soil blowing and erosion and in conserving moisture. This soil is fairly well suited to tame pasture and hay. Alfalfa, intermediate wheatgrass, and smooth bromegrass are suitable.

This soil is well suited to range. The native vegetation dominantly is bluestems and prairie sandreed. Overused areas are dominated by prairie sandreed, needleandthread, western wheatgrass, and sideoats grama. After continued overuse, Kentucky bluegrass, blue grama, and weeds occupy the site.

This soil is well suited to most kinds of building site development, but the sides of shallow excavations tend to cave in unless they are shored. Septic tank absorption fields can function in this soil, but the effluent can pollute shallow ground water.

The capability subclass is IIIe; Sandy range site.

Bo—Bon loam. This deep, moderately well drained, nearly level soil is on flood plains. It is frequently flooded. Areas are 5 to 50 acres in size and generally are long and narrow. Most of the slopes are long and smooth, but some are short and complex.

Typically, the surface layer is dark grayish brown loam about 8 inches thick. The subsurface layer is dark grayish brown, dark gray, and gray, very friable and friable, calcareous loam about 20 inches thick. The underlying material to a depth of 60 inches is grayish brown and pale brown, calcareous loam. In some areas the subsurface layer is noncalcareous. In other areas it is stratified with silt loam and very fine sandy loam.

Included with this soil in mapping are small areas of Arlo, Clamo, Dimo, Durrstein, and Prosper soils. These soils make up less than 15 percent of any one mapped area. The very poorly drained Arlo and poorly drained Clamo and Durrstein soils are in old stream meanders or on the slightly lower parts of the landscape. Dimo and Prosper soils are on the lower side slopes near adjacent uplands. Dimo soils are underlain by gravelly sand. Prosper soils formed in alluvium over glacial till.

The Bon soil is high in fertility and in content of organic matter. Available water capacity is high. Permeability is moderate. Runoff is slow.

About half of the acreage is cropland, and half is range. This soil is well suited to cultivated crops. Conserving moisture is the main concern of management. Stubble mulching, crop residue management, and minimum tillage conserve moisture and improve fertility and tilth. Floodwater delays planting in some years, but in most years the additional moisture is beneficial. The flood damage is minor.

This soil is well suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well.

This soil is well suited to tame pasture and hay. All climatically suited pasture plants, including alfalfa, intermediate wheatgrass, and smooth bromegrass, grow well.

This soil is well suited to range. The native vegetation dominantly is big bluestem and green needlegrass. Overused areas are dominated by less palatable grasses, such as western wheatgrass and Kentucky bluegrass. After continued overuse, Kentucky bluegrass and weeds occupy the site.

This soil generally is unsuitable as a site for most buildings and for sanitary facilities because of the flooding.

The capability subclass is IIc; Overflow range site.

Bx—Bon loam, channeled. This deep, moderately well drained, nearly level soil is on flood plains that are dissected into many small tracts by narrow stream channels and partly filled old stream meanders (fig. 6). It is frequently flooded. Areas are 5 to 80 acres in size and generally are long and narrow.

Typically, the surface layer is dark grayish brown loam about 8 inches thick. The subsurface layer is dark grayish brown, dark gray, and gray, very friable and friable, calcareous loam about 20 inches thick. The underlying material to a depth of 60 inches is grayish brown and pale brown, calcareous loam. In some areas the surface layer is clay loam. In other areas the subsurface layer is noncalcareous. In places the underlying material is stratified with silt loam and very fine sandy loam.

Included with this soil in mapping are small areas of Arlo, Clamo, Dimo, Durrstein, and Prosper soils. These soils make up less than 15 percent of any one mapped area. The very poorly drained Arlo and poorly drained Clamo and Durrstein soils are on the slightly lower parts of the landscape. Dimo and Prosper soils are on the lower side slopes near adjacent uplands. Dimo soils are underlain by gravelly sand. Prosper soils formed in local alluvium over glacial till.

The Bon soil is high in fertility and in content of organic matter. Available water capacity is high. Permeability is moderate. A high water table is at a depth of 2 to 6 feet in the spring of most years. Runoff is slow.

Most areas support native grass. This soil is well suited to range. The native vegetation dominantly is big bluestem and switchgrass. Overused areas are dominated by less palatable grasses, such as western wheatgrass and Kentucky bluegrass. After continued overuse, Kentucky bluegrass and weeds occupy the site.

Because of the meandering channels and the flooding in the spring, this soil generally is unsuited to cultivated crops. It is suited to tame pasture and hay, but the meandering streams generally dissect the fields into small tracts. Alfalfa, intermediate wheatgrass, and smooth bromegrass are suitable.

This soil is suited to the trees and shrubs grown as environmental plantings. All climatically suited trees and shrubs grow well. Because of the meandering stream channels, they generally cannot be planted by machine,

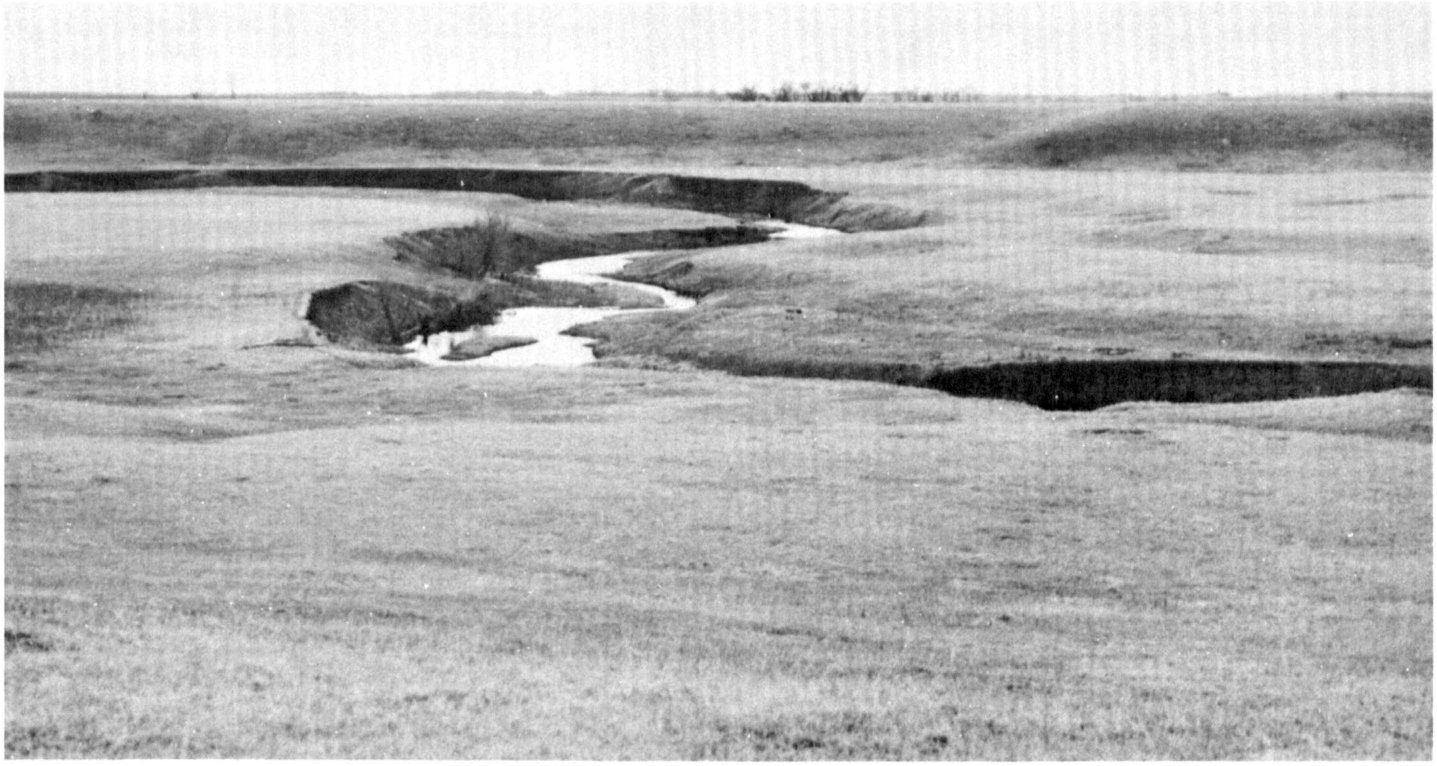

Figure 6.—A meandering channel in an area of Bon loam, channeled.

but hand planted trees and shrubs can be readily established.

This soil generally is unsuitable as a site for buildings and sanitary facilities because of the flooding.

The capability subclass is VIw; Overflow range site.

Ca—Clamo silty clay loam. This deep, poorly drained, nearly level soil is on flood plains. It is occasionally flooded. Areas range from 5 to 40 acres in size and are long and narrow. Slopes are long and smooth.

Typically, the surface layer is dark gray silty clay loam about 3 inches thick. The subsurface layer is dark gray silty clay about 5 inches thick. The subsoil is dark gray, firm silty clay about 26 inches thick. It is calcareous in the lower part. The underlying material to a depth of 60 inches is gray, calcareous silty clay that has nests of gypsum crystals. In places gypsum crystals are in the subsoil.

Included with this soil in mapping are small areas of Bon and Durrstein soils. These soils make up less than 15 percent of any one mapped area. The moderately well drained Bon soils are near old stream channels and on the slightly higher mounds and stream terraces. Durrstein soils have a sodium affected subsoil. They are slightly lower on the landscape than the Clamo soil.

The Clamo soil is medium in fertility and moderate in content of organic matter. Available water capacity is high. Permeability is slow. A high water table is within a depth of 3 feet in the spring of most years. Runoff is slow. The shrink-swell potential is high.

Most areas support native grass. This soil is well suited to range. The native vegetation dominantly is big bluestem. Overused areas are dominated by western wheatgrass, Kentucky bluegrass, and saltgrass. After continued overuse, saltgrass, foxtail barely, and weeds occupy the site.

If drained, this soil is well suited to cultivated crops. It is better suited to late maturing row crops than to early maturing crops. Excess moisture is the major concern of management. Surface and subsurface drainage systems help to reduce the wetness. Tilling is difficult when the soil is too wet or too dry. Returning crop residue to the soil and regularly adding other organic material improve fertility and tilth.

If drained, this soil is well suited to tame pasture and hay. Alfalfa, intermediate wheatgrass, and smooth bromegrass grow well.

If drained, this soil is well suited to windbreaks and environmental plantings. It is especially well suited to the trees and shrubs that grow well in areas where the supply of moisture is high.

This soil generally is unsuitable as a site for buildings and sanitary facilities because of the flooding and the wetness.

The capability subclass is IIw, drained; Subirrigated range site.

CbB—Clarno loam, 3 to 6 percent slopes. This deep, well drained, undulating soil is on uplands. Areas are 5 to 400 acres in size and are irregular in shape. Scattered glacial stones are on the surface in some areas. Slopes are short and complex.

Typically, the surface layer is dark grayish brown loam about 8 inches thick. The subsoil is dark grayish brown, grayish brown, and pale yellow, friable loam about 24 inches thick. It is calcareous in the lower part. The underlying material to a depth of 60 inches is pale yellow, calcareous loam. In some areas the underlying material is stratified fine sandy loam, silt loam, and loamy fine sand. In places carbonates are nearer to the surface.

Included with this soil in mapping are small areas of Hoven, Plankinton, Prosper, and Tetonka soils. These soils make up less than 15 percent of any one mapped area. The poorly drained Hoven, Plankinton, and Tetonka soils are in depressions. Prosper soils are dark to a depth of more than 20 inches. They are in swales.

The Clarno soil is medium in fertility and moderate in content of organic matter. Available water capacity is high. Permeability is moderate in the subsoil and moderately slow in the underlying material. Runoff is medium. The shrink-swell potential is moderate.

Most of the acreage is cropland. This soil is well suited to cultivated crops. Controlling erosion and conserving moisture are the main concerns of management. Stubble mulching, crop residue management, minimum tillage, and grassed waterways help to control erosion, conserve moisture, and improve fertility and tilth. Contour farming and terraces can help to control erosion, but slopes generally are too short or too irregular for contouring and terracing.

This soil is well suited to windbreaks and environmental plantings. Except for those species that can grow well only if the supply of moisture is high, all climatically suited trees and shrubs grow well.

A cover of tame pasture plants or hay is effective in controlling erosion. This soil is well suited to tame pasture and hay. Alfalfa, intermediate wheatgrass, and smooth bromegrass grow well.

This soil is well suited to range. The native vegetation dominantly is bluestems, green needlegrass, and western wheatgrass. Overused areas are dominated by western wheatgrass and other less palatable species. After continued overuse, shortgrasses, such as blue grama and Kentucky bluegrass, and weeds occupy the site.

This soil is fairly well suited to building site development and sanitary facilities. The moderate shrink-swell potential is a limitation on building sites, and the moderately slow permeability is a limitation in septic tank absorption fields. Backfilling with sandy material, providing foundation drains, and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling. Reinforcing foundations and footings also helps to prevent this damage. Enlarging the absorption area in septic tank absorption fields helps to overcome the slow absorption of liquid waste.

The capability subclass is IIe; Silty range site.

CeC—Clarno-Ethan loams, 6 to 9 percent slopes. These deep, well drained, moderately sloping soils are on ridges and along entrenched drainageways on uplands. The Clarno soil is on the smooth and concave mid and lower side slopes and on the broader ridgetops. The Ethan soil is on the convex, narrow ridges, sharp slope breaks, and upper side slopes. In places scattered glacial stones are on the surface. Areas are 5 to 100 acres in size and are irregular in shape. They are 40 to 55 percent Clarno soil and 25 to 40 percent Ethan soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Clarno soil is dark grayish brown loam about 8 inches thick. The subsoil is dark grayish brown, grayish brown, and pale yellow, friable loam about 24 inches thick. It is calcareous in the lower part. The underlying material to a depth of 60 inches is pale yellow, calcareous loam. In some areas the underlying material is stratified silt loam, sandy loam, and clay loam.

Typically, the surface layer of the Ethan soil is dark grayish brown loam about 5 inches thick. The subsoil is dark grayish brown and light brownish gray, friable loam about 17 inches thick. It is calcareous in the lower part. The underlying material to a depth of 60 inches is light yellowish brown, calcareous clay loam. In some areas the surface layer is less than 5 inches thick.

Included with these soils in mapping are small areas of Plankinton, Prosper, and Tetonka soils. These included soils make up less than 20 percent of any one mapped area. The poorly drained Plankinton and Tetonka soils are in depressions. The moderately well drained Prosper soils are in swales and shallow drainageways.

The Clarno soil is medium in fertility and moderate in content of organic matter. The Ethan soil is low in fertility and in content of organic matter. Available water capacity is high in both soils. Permeability is moderate in the subsoil and moderately slow in the underlying material. Runoff is medium. The shrink-swell potential is moderate.

About half of the acreage is range, and half is cropland. These soils are well suited to range. The native vegetation dominantly is bluestems, green needlegrass, and western wheatgrass. Overused areas are dominated by western wheatgrass and other less palatable species. After continued overuse, short grasses, such as blue grama and Kentucky bluegrass, and weeds occupy the site.

These soils are fairly well suited to cultivated crops. Controlling erosion and conserving moisture are the major concerns of management. The high content of lime in the surface layer of the Ethan soil adversely affects the availability of plant nutrients. Stubble mulching, crop residue management, and minimum tillage help to control erosion, conserve moisture, and improve fertility and tilth. Contour farming, grassed waterways, and terraces can help to control erosion, but the slopes in some areas are too short or too irregular for contouring and terracing.

A cover of tame pasture plants or hay is effective in controlling erosion. These soils are well suited to tame pasture and hay, but forage production is limited by the high content of carbonates in the Ethan soil. Alfalfa, intermediate wheatgrass, and smooth bromegrass are the best suited species.

These soils are fairly well suited to windbreaks and environmental plantings. Except for those species that can grow well only if the supply of moisture is high, all climatically suited trees and shrubs grow well on the Clarno soil. No trees or shrubs grow well on the Ethan soil; optimum survival and vigor are unlikely.

Because of the slope and the shrink-swell potential, these soils are only fairly well suited to most kinds of building site development. Buildings should be designed to conform to the natural slope of the land. Land shaping is needed in some areas. Backfilling with sandy material, providing foundation drains, and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling. Reinforcing foundations and footings also helps to prevent this damage.

Because of the slope and the restricted permeability, these soils are only fairly well suited to sanitary facilities. Enlarging the absorption area in septic tank absorption fields helps to overcome the slow absorption of liquid waste. Land shaping and installation of the distribution lines across the slope generally improve the efficiency of the absorption field.

The Clarno soil is in capability subclass IIIe, Ethan soil in capability subclass IVe; both soils are in Silty range site.

CpA—Clarno-Prosper loams, 0 to 3 percent slopes. These deep, nearly level soils are on uplands. The well drained Clarno soil is in smooth and convex areas. The moderately well drained Prosper soil is in swales and poorly defined drainageways. It is occasionally flooded by runoff from the Clarno soil. Areas are 10 to several hundred acres in size and are irregular in shape. They are 45 to 55 percent Clarno soil and 25 to 35 percent Prosper soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Clarno soil is dark grayish brown loam about 8 inches thick. The subsoil is dark grayish brown, grayish brown, and pale yellow, friable loam about 24 inches thick. It is calcareous in the lower part. The underlying material to a depth of 60 inches is pale yellow, calcareous loam. In some areas it is stratified fine sandy loam, silt loam, and loamy fine sand. In places carbonates are within a depth of 10 inches.

Typically, the surface layer of the Prosper soil is dark gray loam about 8 inches thick. The subsurface layer is dark grayish brown loam about 4 inches thick. The subsoil is dark grayish brown, grayish brown, and light brownish gray, friable clay loam about 21 inches thick. It is calcareous in the lower part. The underlying material to a depth of 60 inches is light gray, calcareous clay loam. In some areas the subsoil is loam.

Included with these soils in mapping are small areas of Blendon, Hoven, Plankinton, and Tetonka soils. These included soils make up less than 20 percent of any one mapped area. The Blendon soils contain less clay in the subsoil than the Prosper soil. Their position on the landscape is similar to that of the Prosper soil. The poorly drained Hoven, Plankinton, and Tetonka soils are in depressions.

The Clarno soil is medium in fertility and moderate in content of organic matter. The Prosper soil is high in fertility and in content of organic matter. Available water capacity is high in both soils. Permeability is moderate in the subsoil and moderately slow in the underlying material. The Prosper soil has a high water table at a depth of 3 to 6 feet in the spring of most years. Runoff is slow on both soils. The shrink-swell potential is moderate.

Most of the acreage is cropland. These soils are well suited to cultivated crops and to tame pasture and hay. Alfalfa, intermediate wheatgrass, and smooth bromegrass are the best suited pasture plants. Conserving moisture is the main concern in managing cultivated areas. Stubble mulching, crop residue management, and minimum tillage conserve moisture and improve fertility and tilth.

These soils are well suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well.

These soils are well suited to range. The native vegetation dominantly is bluestems, green needlegrass, and western wheatgrass. Overused areas are dominated by western wheatgrass and other less palatable species. After continued overuse, Kentucky bluegrass and weeds occupy the site.

The Clarno soil is suitable as a building site, but the shrink-swell potential is a limitation. Backfilling with sandy material, providing foundation drains, and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling. Reinforcing foundations and footings also helps to prevent this damage. This soil is well suited to most sanitary facilities. Enlarging the absorption area in septic tank absorption fields helps to overcome the slow absorption of liquid waste.

The Prosper soil is unsuitable as a site for buildings and septic tank absorption fields because it is subject to flooding.

The capability subclass is IIc; Clarno soil in Silty range site, Prosper soil in Overflow range site.

DaA—DeGrey-Jerauld silt loams, 0 to 2 percent slopes. These deep, nearly level soils are on uplands where shallow depressions generally are between poorly defined drainageways. The moderately well drained DeGrey soil is in the slightly higher areas between the shallow depressions. In some of these areas scattered glacial stones are on the surface. The somewhat poorly drained Jerauld soil is in the shallow depressions. Areas are 5 to 300 acres in size and are irregular in shape. They are 40 to 60 percent DeGrey soil and 20 to 40 percent Jerauld soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the DeGrey soil is dark grayish brown silt loam about 6 inches thick. The subsurface layer is gray silt loam about 3 inches thick. The subsoil is about 18 inches thick. It is dark grayish brown, firm silty clay over light olive brown, calcareous, friable silty clay loam. The upper part of the underlying material, to a depth of 48 inches, is light yellowish brown and light brownish gray, calcareous silty clay loam having few or common nests of salts. The lower part to a depth of 60 inches is grayish brown, calcareous clay loam that contains gypsum crystals.

Typically, the surface layer of the Jerauld soil is gray silt loam about 3 inches thick. The subsoil is about 16 inches of dark gray and grayish brown, firm silty clay and clay. It is calcareous and has common nests of gypsum crystals in the lower part. The underlying material to a depth of 60 inches is light brownish gray, calcareous clay loam. It has nests of gypsum crystals.

Included with these soils in mapping are small areas of Eakin, Highmore, Hoven, Onita, and Plankinton soils. These included soils make up less than 20 percent of any one mapped area. Eakin, Highmore, Onita, and Plankinton soils do not have a sodium affected subsoil. Eakin and Highmore soils are slightly higher on the landscape than the DeGrey and Jerauld soils. Onita soils are in swales. The poorly drained Hoven and Plankinton soils are in depressions.

The DeGrey soil is medium in fertility and moderate in content of organic matter. The Jerauld soil is low in fertility and in content of organic matter. Tilth is poor in both soils. Available water capacity is high in the DeGrey soil and moderate in the Jerauld soil. Permeability is slow in the DeGrey soil and slow or very slow in the Jerauld soil. Runoff is slow on both soils. The shrink-swell potential is high.

Most areas support native grass. These soils are fairly well suited to range. The native vegetation dominantly is western wheatgrass and blue grama. Plant growth is very uneven because it is restricted on the Jerauld soil. Overused areas are dominated by saltgrass and weeds or are bare.

These soils are poorly suited to cultivated crops. The best suited crops are those that can grow in a droughty soil that contains sodium salts. Improving tilth, increasing the water intake rate, and conserving moisture are the main concerns of management. Returning crop residue to the soil and applying animal manure improve tilth and fertility and increase the content of organic matter. Stubble mulching, chiseling or subsoiling, crop residue management, and minimum tillage conserve moisture and increase the water intake rate.

The DeGrey soil is fairly well suited to tame pasture and hay, but no tame pasture plants grow well on the Jerauld soil. The best suited tame pasture plants on the DeGrey soil are those that can grow in a soil that has a claypan and contains sodium salts. Alfalfa and intermediate wheatgrass are examples.

These soils are poorly suited to windbreaks and environmental plantings. Some climatically suited trees and shrubs can be established for special purposes on the DeGrey soil, but optimum growth, survival, and vigor are not likely. No trees and shrubs grow well on the Jerauld soil.

The DeGrey soil is only fairly well suited and the Jerauld soil poorly suited to most kinds of building site development because of the shrink-swell potential. Backfilling with sandy material, providing foundation drains, and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling. Reinforcing foundations and footings also helps to prevent this damage.

These soils are poorly suited to septic tank absorption fields because of the restricted permeability. These fields generally do not function well unless they are greatly enlarged.

The DeGrey soil is in capability subclass IVs, Claypan range site; the Jerauld soil is in capability subclass VIs, Thin Claypan range site.

DeA—DeGrey-Onita silt loams, 0 to 2 percent slopes. These deep, moderately well drained, nearly level soils are on uplands. The DeGrey soil is on concave side slopes and near depressions. Scattered glacial stones are on the surface in some areas. The Onita soil is in swales and in poorly defined drainageways. It is occasionally flooded for brief periods by runoff from adjacent uplands. Areas are 10 to 400 acres in size and are irregular in shape. They are 35 to

60 percent DeGrey soil and 20 to 45 percent Onita soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the DeGrey soil is dark grayish brown silt loam about 6 inches thick. The subsurface layer is gray silt loam about 3 inches thick. The subsoil is about 18 inches thick. It is dark grayish brown, firm silty clay over light olive brown, calcareous, friable silty clay loam. The upper part of the underlying material, to a depth of about 48 inches, is light yellowish brown and light brownish gray, calcareous silty clay loam that has nests of salts. The lower part to a depth of 60 inches is grayish brown, calcareous clay loam that has nests of gypsum crystals.

Typically, the surface layer of the Onita soil is very dark gray silt loam about 12 inches thick. The subsoil is about 35 inches of very dark gray and grayish brown, firm silty clay loam and silty clay. The underlying material to a depth of 60 inches is light brownish gray silty clay loam. In some areas loam or clay loam glacial till is within a depth of 40 inches. In places carbonates are at or near the surface.

Included with these soils in mapping are small areas of Eakin, Highmore, Hoven, and Plankinton soils. These included soils make up less than 20 percent of any one mapped area. The well drained Eakin and Highmore soils are slightly higher on the landscape than the DeGrey and Onita soils. The poorly drained Hoven and Plankinton soils are in depressions.

The DeGrey soil is medium in fertility and moderate in content of organic matter. The Onita soil is high in fertility and in content of organic matter. Available water capacity is high in both soils. Permeability is slow in the DeGrey soil and moderately slow in the Onita soil. The Onita soil has a high water table at a depth of 2.5 to 6 feet in the spring of most years. Runoff is slow on both soils. The shrink-swell potential is high.

Most of the acreage is cropland. These soils are fairly well suited to cultivated crops. Crop growth is uneven because it is restricted on the DeGrey soil by droughtiness, a claypan subsoil, and a high content of sodium salts. In some years spring planting and tillage are delayed by the flooding on the Onita soil. Stubble mulching, crop residue management, chiseling or subsoiling, and minimum tillage improve tilth and fertility, increase the water intake rate and the content of organic matter, and conserve moisture. Planting green manure crops improves tilth and increases the content of organic matter.

A cover of tame pasture plants or hay is effective in improving tilth. These soils are fairly well suited to tame pasture and hay. Only those species that can grow in a soil that has a claypan and contains sodium salts are suitable. Alfalfa, crested wheatgrass, and intermediate wheatgrass are examples.

These soils are fairly well suited to range. The native vegetation mainly is western wheatgrass, green needlegrass, bluestems, and blue grama. Overused areas are dominated by less productive short grasses, such as buffalograss, Kentucky bluegrass, and saltgrass.

These soils are fairly well suited to windbreaks and environmental plantings. Climatically suited trees and shrubs can be planted on the DeGrey soil, but optimum survival, growth, and vigor are unlikely. All climatically suited trees and shrubs grow well on the Onita soil.

The DeGrey soil is fairly well suited to most kinds of building site development, but the Onita soil is poorly suited because it is subject to flooding. Backfilling with sandy material, providing foundation drains, and diverting runoff away from the buildings help to prevent the structure damage caused by the shrinking and swelling of the DeGrey soil. Reinforcing foundations and footings also helps to prevent this damage.

These soils are poorly suited to septic tank absorption fields because of the restricted permeability and the flooding. They are suitable, however, as sites for sewage lagoons.

The DeGrey soil is in capability subclass IVs, Claypan range site; the Onita soil is in capability subclass IIc, Overflow range site.

DmA—Delmont-Enet loams, 0 to 2 percent slopes. These nearly level soils are on uplands and high stream terraces. The somewhat excessively drained Delmont soil is in smooth and convex areas, and the well drained Enet soil is in smooth and concave areas. The Delmont soil is shallow over gravelly sand, and the Enet soil is moderately deep over gravelly sand. Areas are 5 to 50 acres in size and are irregular in shape. They are 40 to 55 percent Delmont soil and 25 to 40 percent Enet soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Delmont soil is dark gray loam about 5 inches thick. The subsoil is dark gray, very friable loam about 11 inches thick. The underlying material to a depth of 60 inches is multicolored, calcareous gravelly sand. In some areas the surface layer is sandy loam.

Typically, the surface layer of the Enet soil is dark gray loam about 7 inches thick. The subsoil is dark gray, very friable and friable loam about 17 inches thick. It is calcareous in the lower part. The upper part of the underlying material is light brownish gray, calcareous gravelly sand. The lower part to a depth of 60 inches is multicolored, calcareous, stratified sand and gravel.

Included with these soils in mapping are small areas of Alwilda, Blendon, Dimo, Plankinton, and Tetonka soils. These included soils make up less than 20 percent of any one mapped area. Alwilda and Blendon soils contain less clay in the subsoil than the Delmont and Enet soils. They are in positions on the landscape similar to those of the Enet soil. The somewhat poorly drained Dimo soils are in poorly defined drainageways. The poorly drained Plankinton and Tetonka soils are in depressions.

The Delmont and Enet soils are medium in fertility and moderate in content of organic matter. Available water capacity is low in the Delmont soil and moderate in the Enet soil. Permeability is moderate in the subsoil of both soils and rapid in the underlying material. Runoff is slow.

About half of the acreage is range, and half is cropland. These soils are fairly well suited to range. The native vegetation dominantly is needlegrasses. Overused areas are dominated by blue grama and threadleaf sedge.

These soils are fairly well suited to cultivated crops. Small grain and grasses are better suited than late maturing crops, such as corn. Droughtiness is the major concern of management. Crop residue management, minimum tillage, and stubble mulching conserve moisture. Applying fertilizer improves fertility.

These soils are fairly well suited to tame pasture and hay. Only those grasses that are drought resistant are suitable. Crested wheatgrass is an example.

These soils are poorly suited to windbreaks and environmental plantings. No trees and shrubs grow well, and optimum survival and vigor are unlikely.

Though these soils are well suited to most kinds of building site development, the sides of shallow excavations tend to cave in unless they are shored. Septic tank absorption fields can function in these soils, but the effluent can pollute shallow ground water. The soils are a probable source of gravelly sand for use as road construction material.

The Delmont soil is in capability subclass IVs, Shallow to Gravel range site; the Enet soil is in capability subclass IIIs, Silty range site.

DmB—Delmont-Enet loams, 2 to 6 percent slopes. These undulating soils are in areas on uplands and high stream terraces where slopes are short and complex. The somewhat excessively drained Delmont soil is on the convex upper side slopes and the crests of knolls and ridges. The well drained Enet soil is on the lower side slopes and slightly concave foot slopes. The Delmont soil is shallow over gravelly sand, and the Enet soil is moderately deep over gravelly sand. Areas are 5 to 100 acres in size and are irregular in shape. They are 45 to 60 percent Delmont soil and 20 to 35 percent Enet soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Delmont soil is dark gray loam about 5 inches thick. The subsoil is dark gray, very friable loam about 11 inches thick. The underlying material to a depth of 60 inches is multicolored, calcareous gravelly sand.

Typically, the surface layer of the Enet soil is dark gray loam about 7 inches thick. The subsoil is dark gray, very friable and friable loam about 17 inches thick. It is calcareous in the lower part. The upper part of the underlying material is light brownish gray, calcareous gravelly sand. The lower part to a depth of 60 inches is multicolored, calcareous, stratified sand and gravel. In some areas loam and clay loam glacial till is below a depth of 40 inches.

Included with these soils in mapping are small areas of Alwilda, Blendon, Dimo, Talmo, and Plankinton soils. These included soils make up less than 20 percent of any one mapped area. Alwilda and Blendon soils contain less clay in the subsoil than the Delmont and Enet soils. They are in positions on the landscape similar to those of the Enet soil. The somewhat poorly drained Dimo soils are in drainageways. Talmo soils are underlain by gravelly sand at a depth of 14 inches or less. They are on narrow ridges. The poorly drained Plankinton soils are in depressions.

The Delmont and Enet soils are medium in fertility and moderate in content of organic matter. Available water capacity is low in the Delmont soil and moderate in the Enet soil. Permeability is moderate in the subsoil of both soils and rapid in the underlying material. Runoff is medium.

Most areas support native grass. These soils are fairly well suited to range. The native vegetation dominantly is needleandthread and needlegrasses. Overused areas are dominated by blue grama, Kentucky bluegrass, and threadleaf sedge.

These soils are poorly suited to cultivated crops. Small grain and grasses are better suited than late maturing crops, such as corn. Controlling erosion, conserving moisture, and improving fertility are the main concerns of management. Stubble mulching, crop residue management, and minimum tillage help to control erosion, conserve moisture, and improve fertility.

A cover of tame pasture plants or hay is effective in controlling erosion. These soils are fairly well suited to tame pasture and hay. Only those grasses that are drought resistant are suitable. Crested wheatgrass, alfalfa, and intermediate wheatgrass are examples.

These soils are poorly suited to windbreaks and environmental plantings. No trees and shrubs grow well, and optimum survival and vigor are unlikely.

These soils are well suited to most kinds of building site development, but the sides of shallow excavations tend to cave in unless they are shored. Septic tank absorption fields can function in these soils, but the effluent can pollute shallow ground water. The soils are a probable source of gravelly sand for use as road construction material.

The Delmont soil is in capability subclass IVe, Shallow to Gravel range site; the Enet soil is in capability subclass IIIe, Silty range site.

DnC—Delmont-Talmo complex, 6 to 15 percent slopes. These gently rolling and rolling soils are on ridges and slope breaks on high stream terraces. Slopes generally are short and complex. The somewhat excessively drained Delmont soil is on the smooth or convex mid and lower side slopes. The excessively drained Talmo soil is on ridgetops and slope breaks. The Delmont soil is shallow over gravelly sand, and the Talmo soil is very shallow over gravelly sand. Areas are 5 to 60 acres in size and are irregular in shape. They are 45 to 60 percent Delmont soil and 20 to 35 percent Talmo soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Delmont soil is dark gray loam about 5 inches thick. The subsoil is dark gray, very friable loam about 11 inches thick. The underlying material to a depth of 60 inches is multicolored, calcareous gravelly sand. In some areas the depth to the gravelly sand is more than 20 inches.

Typically, the surface layer of the Talmo soil is very dark gray gravelly loam about 9 inches thick. The underlying material to a depth of 60 inches is multicolored, calcareous gravelly sand. In some areas glacial till is below a depth of 40 inches.

Included with these soils in mapping are small areas of Alwilda, Betts, Blendon, Dimo, and Ethan soils. These included soils make up less than 20 percent of any one mapped area. Alwilda and Blendon soils do not have gravelly sand within a depth of 20 inches. They are less sloping than the Delmont and Talmo soils. Betts and Ethan soils are not underlain by gravelly sand. They are in positions on the landscape similar to those of the Talmo soil. The somewhat poorly drained Dimo soils are in swales and drainageways.

Fertility is medium in the Delmont soil and low in the Talmo soil. The content of organic matter is moderate in the Delmont soil and low in the Talmo soil. Available water capacity is low in both soils. Permeability is moderate in the subsoil of the Delmont soil and rapid in the underlying material. It is rapid in the Talmo soil. Runoff is medium on the Delmont soil and slow on the Talmo soil.

Nearly all areas support native grass. These soils are fairly well suited to range. The native vegetation dominantly is needleandthread and blue grama. Overused areas are dominated by blue grama, threadleaf sedge, and weeds.

Because they are droughty and are gently rolling and rolling, these soils generally are unsuited to cultivated crops and to windbreaks and environmental plantings and are poorly suited to tame pasture and hay. Some trees and shrubs can be established for special purposes if they are planted by hand and given special care.

These soils are fairly well suited to most kinds of building site development, but the sides of shallow excavations tend to cave in unless they are shored. Land shaping is needed in some of the steeper areas on the Talmo soil. Septic tank absorption fields can function in these soils, but the effluent can pollute shallow ground water. The soils are a probable source of gravelly sand for use as road construction material.

The Delmont soil is in capability subclass VIe, Shallow to Gravel range site; the Talmo soil is in capability subclass VIs, Very Shallow range site.

Do—Dimo loam. This somewhat poorly drained, nearly level soil is in swales on uplands. It is frequently flooded by runoff from the adjacent uplands. It is moderately deep over gravelly sand. Areas are 5 to 40 acres in size and generally are long and narrow. Slopes are short and are smooth or concave.

Typically, the surface layer is very dark gray loam about 7 inches thick. The subsoil is about 24 inches of very dark gray and grayish brown, friable loam and clay loam. It is calcareous in the lower part. The underlying material to a depth of 60 inches is multicolored, calcareous gravelly sand.

Included with this soil in mapping are small areas of Arlo, Delmont, Enet, and Plankinton soils. These soils make up less than 15 percent of any one mapped area. The very poorly drained Arlo and poorly drained Plankinton soils are in depressions. The somewhat excessively drained Delmont and well drained Enet soils are slightly higher on the landscape than the Dimo soil.

The Dimo soil is high in fertility and in content of organic matter. Available water capacity is moderate. Permeability is moderate in the subsoil and rapid in the underlying material. A high water table is at a depth of 2 to 6 feet during most of the growing season. Runoff is slow. The shrink-swell potential is moderate in the subsoil.

Most areas support native grass. This soil is well suited to range. The native vegetation dominantly is big bluestem. Overused areas are dominated by less palatable grasses, such as western wheatgrass and Kentucky bluegrass. After continued overuse, Kentucky bluegrass and weeds occupy the site.

This soil is fairly well suited to cultivated crops. Conserving moisture for use late in the growing season is the main concern of management. Stubble mulching, crop residue management, and minimum tillage conserve moisture and improve tilth and fertility.

This soil is well suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well.

This soil is well suited to tame pasture and hay. Alfalfa, crested wheatgrass, intermediate wheatgrass, and smooth bromegrass are suitable.

Because of the seasonal high water table and the flooding, this soil generally is unsuitable as a site for most buildings and sanitary facilities. It is a probable source of gravelly sand for use as road construction material.

The capability subclass is IIIs; Overflow range site.

DsA—Dudley-Jerauld silt loams, 0 to 2 percent slopes. These deep, nearly level soils are on uplands. The moderately well drained Dudley soil is in the higher lying smooth areas near shallow depressions. Scattered glacial stones are on the surface in some of these areas. The somewhat poorly drained Jerauld soil is in the shallow depressions. Areas are 5 to 300 acres in size and are irregular in shape. They are 40 to 60 percent Dudley soil and 20 to 40 percent Jerauld soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Dudley soil is dark gray silt loam about 7 inches thick. The subsurface layer is gray silt loam about 2 inches thick. The subsoil is very dark grayish brown, dark grayish brown, and grayish brown clay loam about 21 inches thick. It is very firm in the upper part and friable and calcareous in the lower part. Many nests of salts are in the lower part. The underlying material to a depth of 60 inches is light brownish gray and light yellowish brown, calcareous clay loam. It has common nests of salts.

Typically, the Jerauld soil has a surface layer of gray silt loam about 3 inches thick. The subsoil is about 16 inches of dark gray and grayish brown, firm silty clay and clay. In the lower part it is calcareous and has common nests of gypsum crystals. The underlying material to a depth of 60 inches is light brownish gray, calcareous clay loam. It has nests of gypsum crystals.

Included with these soils in mapping are small areas of Beadle, Houdek, Hoven, Plankinton, and Prosper soils. These included soils make up less than 20 percent of any one mapped area. The well drained Beadle and Houdek soils are on the slightly higher ridges and knolls. The poorly drained Hoven and Plankinton soils are in depressions. Prosper soils do not have a sodium affected subsoil. They are in swales.

Fertility is medium in the Dudley soil and low in the Jerauld soil. The content of organic matter is moderate in the Dudley soil and low in the Jerauld soil. Tilth is poor in both soils. Available water capacity is high in the Dudley soil and moderate in the Jerauld soil. Permeability is slow in the Dudley soil and slow or very slow in the Jerauld soil. Runoff is slow on both soils. The shrink-swell potential is high.

Most areas support native grass. These soils are fairly well suited to range. The native vegetation dominantly is western wheatgrass and blue grama. Overused areas are dominated by buffalograss, saltgrass, and weeds or are bare.

The Dudley soil is suited to cultivated crops, but it occurs as areas so closely intermingled with areas of the poorly suited Jerauld soil that it cannot be farmed separately. The only suitable crops are those that can grow in a droughty soil that contains sodium salts. Improving tilth, increasing the water intake rate, and conserving moisture are the main concerns of management. Returning crop residue to the soil and applying animal manure improve tilth and fertility and increase the content of organic matter. Stubble mulching, chiseling or subsoiling, and minimum tillage conserve moisture and increase the water intake rate.

These soils are fairly well suited to tame pasture and hay. The only suitable tame pasture plants are those that can grow in a soil that has a claypan and contains sodium salts. Alfalfa, crested wheatgrass, intermediate wheatgrass, and pubescent wheatgrass are examples.

These soils are poorly suited to windbreaks and environmental plantings. Some climatically suited trees and shrubs can be established for special purposes on the Dudley soil, but optimum growth, survival, and vigor are unlikely. No trees and shrubs grow well on the Jerauld soil.

The Dudley soil is only fairly well suited and the Jerauld soil poorly suited to most kinds of building site development because of the shrink-swell potential. Backfilling with sandy material, providing foundation drains, and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling. Reinforcing foundations and footings also helps to prevent this damage.

These soils are poorly suited to septic tank absorption fields because of the restricted permeability. These fields generally do not function well unless they are greatly enlarged.

The Dudley soil is in capability subclass IVs, Claypan range site; the Jerauld soil is in capability unit VIs, Thin Claypan range site.

Du—Durrstein silt loam. This deep, poorly drained, level and nearly level soil is on flood plains that commonly are dissected by meandering narrow stream channels. It is frequently flooded. Areas are 5 to several hundred acres in size and generally are long and narrow. Slopes generally are long and smooth.

Typically, the surface layer is gray silt loam about 2 inches thick. The subsoil is about 16 inches of dark gray and gray, firm clay loam and silty clay. It has nests of salts and gypsum crystals in the lower part. The underlying material to a depth of 60 inches is grayish brown, light brownish gray, gray, and light olive gray, calcareous silty clay.

Included with this soil in mapping are small areas of Bon and Clamo soils on the slightly higher parts of the landscape. These soils make up less than 15 percent of any one mapped area. They do not have a sodium affected subsoil.

The Durrstein soil is low in fertility and in content of organic matter. Tilth is poor. Root penetration is restricted by the dense claypan subsoil and the high content of sodium salts. Available water capacity is moderate. Permeability is slow or very slow. A seasonal high water table is within a depth of 1 foot in the spring of most years. Runoff is slow. The shrink-swell potential is high.

Most areas support native grass. This soil is fairly well suited to range. The native vegetation dominantly is prairie cordgrass, inland saltgrass, and western wheatgrass. Overused areas are dominated by saltgrass, foxtail barley, and weeds or are bare. Many areas are potential sites for excavated ponds.

This soil generally is unsuited to cultivated crops and to windbreaks and environmental plantings. The dense claypan subsoil and the sodium salts inhibit plant growth.

This soil is fairly well suited to tame pasture and hay. The number of suitable tame pasture plants is severely limited by the high content of sodium. Tall wheatgrass and western wheatgrass are the best suited species.

This soil is poorly suited to building site development and sanitary facilities because of the flooding and the wetness.

The capability subclass is VIw; Saline Lowland range site.

EdA—Eakin-DeGrey silt loams, 0 to 3 percent slopes. These deep, gently undulating soils are in areas on uplands where slopes are short and complex. The well drained Eakin soil is on the smooth and convex parts of low knolls. The moderately well drained DeGrey soil is on smooth and concave side slopes and in plane areas. In some areas scattered glacial stones are on the surface. Areas are 20 to 400 acres in size and are irregular in shape. They are 35 to 60 percent Eakin soil and 20 to 45 percent DeGrey soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Eakin soil is dark grayish brown silt loam about 5 inches thick. The subsoil is about 21 inches thick. It is grayish brown and light olive brown, firm silty clay loam over light yellowish brown and light brownish gray, calcareous, friable silt loam. The underlying material to a depth of 60 inches is light brownish gray, calcareous clay loam. It has gypsum crystals in the lower part. In some areas glacial till is below a depth of 40 inches. In other areas it is within a depth of 20 inches.

Typically, the surface layer of the DeGrey soil is dark grayish brown silt loam about 6 inches thick. The subsurface layer is gray silt loam about 3 inches thick. The subsoil is about 18 inches thick. It is dark grayish brown, firm silty clay over light olive brown, calcareous, friable silty clay loam. The upper part of the underlying material, to a depth of about 48 inches, is light yellowish brown and light brownish gray, calcareous silty clay loam that has nests of salts. The lower part to a depth of 60 inches is grayish brown, calcareous clay loam.

Included with these soils in mapping are small areas of Ethan, Hoven, Jerauld, Onita, and Plankinton soils. These included soils make up less than 20 percent of any one mapped area. Ethan soils formed in glacial till on the higher parts of the landscape. The poorly drained Hoven and Plankinton soils are in depressions. The somewhat poorly drained Jerauld soils are in positions on the landscape similar to those of the DeGrey soil. Onita soils are dark to a depth of more than 20 inches. They are in swales and drainageways.

The Eakin and DeGrey soils are medium in fertility and moderate in content of organic matter. Tilth is poor in the DeGrey soil. Available water capacity is high in both soils. Permeability is moderate in the subsoil of the Eakin soil and moderately slow in the underlying material. It is slow in the DeGrey soil. Runoff is slow on both soils. The shrink-swell potential is moderate in the Eakin soil and high in the DeGrey soil.

About half of the acreage is cropland, and half is range. These soils are fairly well suited to cultivated crops. The Eakin soil is better suited than the DeGrey soil, but it occurs as areas so closely intermingled with areas of the DeGrey soil that it generally cannot be farmed separately. Root penetration is restricted by the dense claypan subsoil and the high content of sodium salts in the DeGrey soil. Improving tilth, increasing the water intake rate, and conserving moisture are the main concerns in managing the DeGrey soil. Stubble mulching, crop residue management, and minimum tillage conserve moisture. Returning crop residue to the soil and planting green manure crops improve fertility and tilth. Chiseling or subsoiling increases the water intake rate.

These soils are suited to tame pasture and hay. The best suited tame pasture plants on the DeGrey soil are those that can grow in a soil that has a claypan and contains sodium salts. Alfalfa, intermediate wheatgrass, and smooth bromegrass are suitable.

These soils are well suited to range. The native vegetation dominantly is western wheatgrass and green needlegrass. Overused areas are dominated by blue grama, Kentucky bluegrass, and saltgrass.

These soils are fairly well suited to windbreaks and environmental plantings. Except for those species that can grow well only if the supply of moisture is high, all climatically suited trees and shrubs grow well on the Eakin soil. No trees and shrubs grow well on the DeGrey soil; optimum survival and vigor are unlikely.

Because of the shrink-swell potential, these soils are only fairly well suited to building site development. Backfilling with sandy material, providing foundation drains, and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling. Reinforcing foundations and footings also helps to prevent this damage.

Because of the restricted permeability, the Eakin soil is only fairly well suited and the DeGrey soil poorly suited to septic tank absorption fields. Enlarging the absorption area of these fields helps to overcome the slow absorption of liquid waste.

The Eakin soil is in capability subclass IIc, Silty range site; the DeGrey soil is in capability subclass IVs, Claypan range site.

EeB—Eakin-Ethan complex, 2 to 6 percent slopes. These deep, well drained, gently sloping soils are on uplands. The Eakin soil is on the smooth and convex mid and lower side slopes. The Ethan soil is on ridges and the upper side slopes. Most of the slopes are long and smooth, but some are short and complex. In some areas a few scattered glacial stones are on the surface. Areas are 10 to 300 acres in size and are irregular in shape. They are 35 to 60 percent Eakin soil and 20 to 45 percent Ethan soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Eakin soil is dark grayish brown silt loam about 5 inches thick. The subsoil is about 21 inches thick. It is grayish brown and light olive brown, firm silty clay loam over light yellowish brown and light brownish gray, friable, calcareous silt loam. The underlying material to a depth of 60 inches is light brownish gray, calcareous clay loam. It has gypsum crystals in the lower part. In some areas glacial till is below a depth of 40 inches. In other areas it is within a depth of 20 inches.

Typically, the surface layer of the Ethan soil is dark grayish brown loam about 5 inches thick. The subsoil is dark grayish brown and light brownish gray, friable loam about 17 inches thick. It is calcareous in the lower part. The underlying material to a depth of 60 inches is light yellowish brown, calcareous clay loam. In some areas the surface layer is less than 5 inches thick.

Included with these soils in mapping are small areas of DeGrey, Hoven, Onita, and Plankinton soils. These included soils make up less than 20 percent of any one mapped area. DeGrey soils have a sodium affected subsoil. They are in concave areas on short side slopes. Onita soils are dark to a depth of more than 20 inches. They are in swales. The poorly drained Hoven and Plankinton soils are in depressions.

The Eakin soil is medium in fertility and moderate in content of organic matter. The Ethan soil is low in fertility and in content of organic matter. Available water capacity is high in both soils. Permeability is moderate in the subsoil and moderately slow in the underlying material. Runoff is medium. The shrink-swell potential is moderate.

Most of the acreage is cropland. These soils are well suited to cultivated crops. Controlling erosion and conserving moisture are the main concerns of management. The high content of lime in the surface layer of the Ethan soil adversely affects the availability of plant nutrients. Stubble mulching, crop residue management, and minimum tillage help to control erosion, conserve moisture, and improve fertility and tilth. Contour farming and terraces can help to control erosion, but in some areas the slopes are too short or too irregular for contouring and terracing.

A cover of tame pasture plants or hay is effective in controlling erosion. These soils are well suited to tame pasture and hay. Alfalfa, intermediate wheatgrass, and smooth bromegrass are the best suited species.

These soils are well suited to range. The native vegetation dominantly is green needlegrass and western wheatgrass. Overused areas are dominated by blue grama, Kentucky bluegrass, and weeds.

These soils are fairly well suited to windbreaks and environmental plantings. Except for those species that can grow well only if the supply of moisture is high, all climatically suited trees and shrubs grow well on the Eakin soil. No trees and shrubs grow well on the Ethan soil; some climatically suited trees and shrubs can be established for special purposes, but optimum survival and vigor are unlikely.

These soils are fairly well suited to most kinds of building site development and sanitary facilities. The shrink-swell potential is a limitation on building sites, and the restricted permeability is a limitation in septic tank absorption fields. Backfilling with sandy material, providing foundation drains, and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling. Reinforcing foundations and footings also helps to prevent this damage. Enlarging the absorption area in septic tank absorption fields helps to overcome the slow absorption of liquid waste.

The Eakin soil is in capability subclass IIe, the Ethan soil in capability subclass IIIe; both soils are in Silty range site.

EnA—Enet loam, 0 to 2 percent slopes. This well drained, nearly level soil is on uplands and high stream terraces. It is moderately deep to gravelly sand. Areas are 5 to l00 acres in size and are irregular in shape. Slopes generally are smooth.

Typically, the surface layer is dark gray loam about 7 inches thick. The subsoil is dark gray, very friable and friable loam about 17 inches thick. It is calcareous in the lower part. The upper part of the underlying material is light brownish gray, calcareous gravelly sand. The lower part to a depth of 60 inches is multicolored, stratified, calcareous sand and gravel. In places the subsoil is fine sandy loam. In some areas clay loam glacial till is below a depth of 40 inches. In other areas gravelly sand is within a depth of 20 inches.

Included with this soil in mapping are small areas of Arlo, Blendon, Dimo, Plankinton, and Tetonka soils. These soils make up less than l5 percent of any one mapped area. The very poorly drained Arlo and poorly drained Plankinton and Tetonka soils are in depressions. Blendon soils contain less clay and more sand in the subsoil than the Enet soil. Their position in the landscape is similar to that of the Enet soil. The somewhat poorly drained Dimo soils are in the deeper swales.

The Enet soil is medium in fertility and moderate in content of organic matter. Available water capacity is moderate. Permeability is moderate in the subsoil and rapid in the underlying material. Runoff is slow.

Most of the acreage is cropland. This soil is fairly well suited to cultivated crops. Conserving moisture is the main concern of management. Stubble mulching, crop residue management, and minimum tillage conserve moisture and improve tilth and fertility. The soil is well suited to irrigation.

This soil is poorly suited to windbreaks and environmental plantings because it is droughty. Some trees and shrubs can be established for special purposes, but optimum survival, growth, and vigor are unlikely.

This soil is well suited to tame pasture and hay. Except for those species that can grow well only if the moisture supply is high, all climatically suited pasture plants are suitable. Alfalfa, crested wheatgrass, intermediate wheatgrass, and smooth bromegrass are the best suited species.

This soil is well suited to range. The native vegetation dominantly is green needlegrass and western wheatgrass. Overused areas are dominated by blue grama, Kentucky bluegrass, and weeds.

Though this soil is well suited to building site development, the sides of shallow excavations tend to cave in unless they are shored. The soil is poorly suited to sanitary facilities because of seepage and a poor filtering capacity. Septic tank absorption fields can function adequately, but the effluent can pollute shallow ground water. The soil is a probable source of gravelly sand for use as road construction material.

The capability subclass is IIIs; Silty range site.

EtD—Ethan-Betts loams, 9 to 15 percent slopes. These deep, well drained, strongly sloping soils are on ridges and along entrenched drainageways. The Ethan soil is on smooth and convex side slopes and the wider ridges. The Betts soil is on narrow ridges and the convex upper side slopes. In some areas scattered glacial stones are on the surface. Areas are 5 to 100 acres in size and are irregular in shape. They are 35 to 55 percent Ethan soil and 25 to 45 percent Betts soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Ethan soil is dark grayish brown loam about 5 inches thick. The subsoil is dark grayish brown and light brownish gray, friable loam about 17 inches thick. It is calcareous in the lower part. The underlying material to a depth of 60 inches is light yellowish brown, calcareous clay loam. In some areas the surface layer is calcareous. In other areas it is silt loam. In places carbonates are at a depth of more than 10 inches.

Typically, the surface layer of the Betts soil is dark grayish brown, calcareous loam about 3 inches thick. The subsoil is light brownish gray, friable, calcareous clay loam about 5 inches thick. The underlying material to a depth of 60 inches is light gray, calcareous clay loam. It has gypsum crystals in the lower part. In some areas the surface layer is silt loam.

Included with these soils in mapping are small areas of Delmont, Eakin, Houdek, and Talmo soils. These included soils make up less than 20 percent of any one mapped area. Delmont and Talmo soils are underlain by gravelly sand. They are on ridgetops and the upper side slopes near gravelly areas. Eakin and Houdek soils have carbonates at a depth of 10 inches or more. They are less sloping than the Ethan and Betts soils.

The Ethan and Betts soils are low in fertility and in content of organic matter. Available water capacity is high. Permeability is moderate in the subsoil and moderately slow in the underlying material. Runoff is rapid. The shrink-swell potential is moderate.

Most areas support native grass. These soils are well suited to range. The native vegetation dominantly is western wheatgrass, bluestems, and green needlegrass. Overused areas are dominated by blue grama and Kentucky bluegrass.

These soils generally are unsuited to cultivated crops and to windbreaks and environmental plantings. Some climatically suited trees and shrubs can be established for special purposes if they are planted by hand and given special care.

These soils are fairly well suited to tame pasture and hay. Forage production and the number of suitable tame pasture plants are limited by the low fertility, by the high content of carbonates, and by a severe erosion hazard. Alfalfa, intermediate wheatgrass, and smooth bromegrass are the best suited species.

Because of the shrink-swell potential and the slope, these soils are only fairly well suited to most kinds of building site development. Buildings should be designed to conform to the natural slope of the land. Land shaping is needed in some areas. Reseeding and shaping slopes that have been cut during construction can help to prevent excessive erosion. Backfilling with sandy material, providing foundation drains, and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling. Reinforcing foundations and footings also helps to prevent this damage.

Because of the restricted permeability and the slope, these soils are only fairly well suited to sanitary facilities. Enlarging the absorption area in septic tank absorption fields helps to overcome the slow absorption of liquid waste. Land shaping and installation of the distribution lines across the slope generally improve the efficiency of the absorption field.

The capability subclass is VIe; Ethan soil in Silty range site, Betts soil in Thin Upland range site.

HbA—Highmore-Onita silt loams, 0 to 2 percent slopes. These deep, nearly level soils are on uplands. The well drained Highmore soil is on slight rises.

Scattered glacial stones are on the surface in some areas. The moderately well drained Onita soil is in shallow depressions, swales, and poorly defined drainageways. It is occasionally flooded by runoff from the Highmore soil. Areas are 20 to 400 acres in size and irregular in shape. They are 40 to 60 percent Highmore soil and 20 to 40 percent Onita soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Highmore soil is dark grayish brown silt loam about 8 inches thick. The subsoil is about 18 inches thick. It is grayish brown and brown, friable silty clay loam over light brownish gray, calcareous silt loam. The upper part of the underlying material, to a depth of 50 inches, is light brownish gray, calcareous silt loam. The lower part to a depth of 60 inches is light brownish gray, calcareous clay loam. In some areas glacial till is within a depth of 40 inches.

Typically, the surface layer of the Onita soil is very dark gray silt loam about 12 inches thick. The subsoil is about 35 inches of very dark gray and grayish brown, firm silty clay loam and silty clay. The underlying material to a depth of 60 inches is light brownish gray silty clay loam. In places carbonates are at or near the surface.

Included with these soils in mapping are small areas of DeGrey, Hoven, and Plankinton soils. These included soils make up less than 20 percent of any one mapped area. DeGrey soils have a sodium affected subsoil. They are in slightly concave areas. The poorly drained Hoven and Plankinton soils are in depressions.

The Highmore soil is medium in fertility and moderate in content of organic matter. The Onita soil is high in fertility and in content of organic matter. Available water capacity is high in both soils. Permeability is moderately slow. The Onita soil has a seasonal high water table at a depth of 2.5 to 6.0 feet in the spring of most years. Runoff is slow on both soils. The shrink-swell potential is moderate in the Highmore soil and high in the Onita soil.

Most of the acreage is cropland. These soils are well suited to cultivated crops. Conserving moisture is the main concern of management. Stubble mulching, crop residue management, and minimum tillage conserve moisture and improve fertility and tilth. In some years planting and harvesting are delayed by wetness on the Onita soil. The soils are suitable for irrigation.

These soils are well suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well.

These soils are well suited to tame pasture and hay. Alfalfa, intermediate wheatgrass, and smooth bromegrass are suitable.

These soils are well suited to range. The native vegetation dominantly is big bluestem, green needlegrass, and western wheatgrass. Overused areas are dominated by needleandthread, blue grama, and Kentucky bluegrass.

The Onita soil is poorly suited to building site development and sanitary facilities because it is subject to flooding. The Highmore soil is fairly well suited, but the shrink-swell potential is a limitation on building sites and the restricted permeability is a limitation in septic tank absorption fields. Backfilling with sandy material, providing foundation drains, and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling. Reinforcing foundations and footings also helps to prevent this damage. Enlarging the absorption area in septic tank absorption fields helps to overcome the slow absorption of liquid waste.

The capability subclass is IIc; Highmore soil in Silty range site, Onita soil in Overflow range site.

HdA—Houdek-Dudley complex, 0 to 3 percent slopes. These deep, gently undulating soils are on uplands. The well drained Houdek soil is in smooth and slightly convex areas. Scattered stones are on the surface in some of these areas. The moderately well drained Dudley soil is in plane areas and on short, concave side slopes. Areas are 5 to several thousand acres in size and are irregular in shape. They are 35 to 60 percent Houdek soil and 20 to 45 percent Dudley soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Houdek soil is dark grayish brown loam about 7 inches thick. The subsoil is grayish brown and light brownish gray, friable clay loam about 24 inches thick. It is calcareous in the lower part. The underlying material to a depth of 60 inches is pale yellow, calcareous clay loam. In places it is stratified loam, silt loam, and sandy loam.

Typically, the surface layer of the Dudley soil is dark gray silt loam about 7 inches thick. The subsurface layer is gray silt loam about 2 inches thick. The subsoil is very dark grayish brown, dark grayish brown, and grayish brown clay loam about 21 inches thick. It is very firm in the upper part and friable and calcareous in the lower part. The underlying material to a depth of 60 inches is light brownish gray and light yellowish brown, calcareous clay loam. Nests of gypsum crystals and accumulations of carbonate are in the lower part of the subsoil and in the underlying material.

Included with these soils in mapping are small areas of Beadle, Hoven, Jerauld, Plankinton, and Prosper soils. These included soils make up less than 20 percent of any one mapped area. Beadle soils contain more clay in the subsoil than the Houdek soil and do not have the sodium affected subsoil characteristic of the Dudley soil. Their position on the landscape is similar to that of the Houdek soil. The poorly drained Hoven and Plankinton soils are in depressions. Jerauld soils have salts at a depth of 16 inches or less. Their position on the landscape is similar to that of the Dudley soil. The moderately well drained Prosper soils do not have a sodium affected subsoil and are dark to a depth of more than 20 inches.

The Houdek and Dudley soils are medium in fertility and moderate in content of organic matter. Available water capacity is high in both soils. Permeability is moderate in the subsoil of the Houdek soil and moderately slow in the underlying material. It is slow in the Dudley soil. Runoff is slow in both soils. The shrink-swell potential is moderate in the Houdek soil and high in the Dudley soil.

Most of the acreage is cropland. These soils are fairly well suited to cultivated crops. In areas of the Dudley soil, tilling is difficult and root penetration is restricted because of the dense claypan subsoil and the high content of sodium salts. Crop residue management (fig. 7), minimum tillage, chiseling or subsoiling, and stubble mulching improve tilth and fertility, increase the content of organic matter and the water intake rate, and conserve moisture. Planting green manure crops also improves tilth.

These soils are well suited to tame pasture and hay. The best suited tame pasture plants are those that can grow in a soil that has a claypan and contains sodium salts. Alfalfa, intermediate wheatgrass, and pubescent wheatgrass are examples.

These soils are well suited to range. The native vegetation dominantly is green needlegrass and western wheatgrass. Overused areas are dominated by western wheatgrass, blue grama, and Kentucky bluegrass. After continued overuse on the Dudley soil, saltgrass is established in many areas and much of the surface is bare.

These soils are fairly well suited to windbreaks and environmental plantings. Except for those species that can grow well only if the supply of moisture is high, all climatically suited trees and shrubs grow well on the Houdek soil. No trees and shrubs grow well on the Dudley soil; optimum survival and vigor are unlikely.

Because of the shrink-swell potential, these soils are only fairly well suited to most kinds of building site development. Backfilling with sandy material, providing foundation drains, and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling. Reinforcing foundations and footings also helps to prevent this damage.

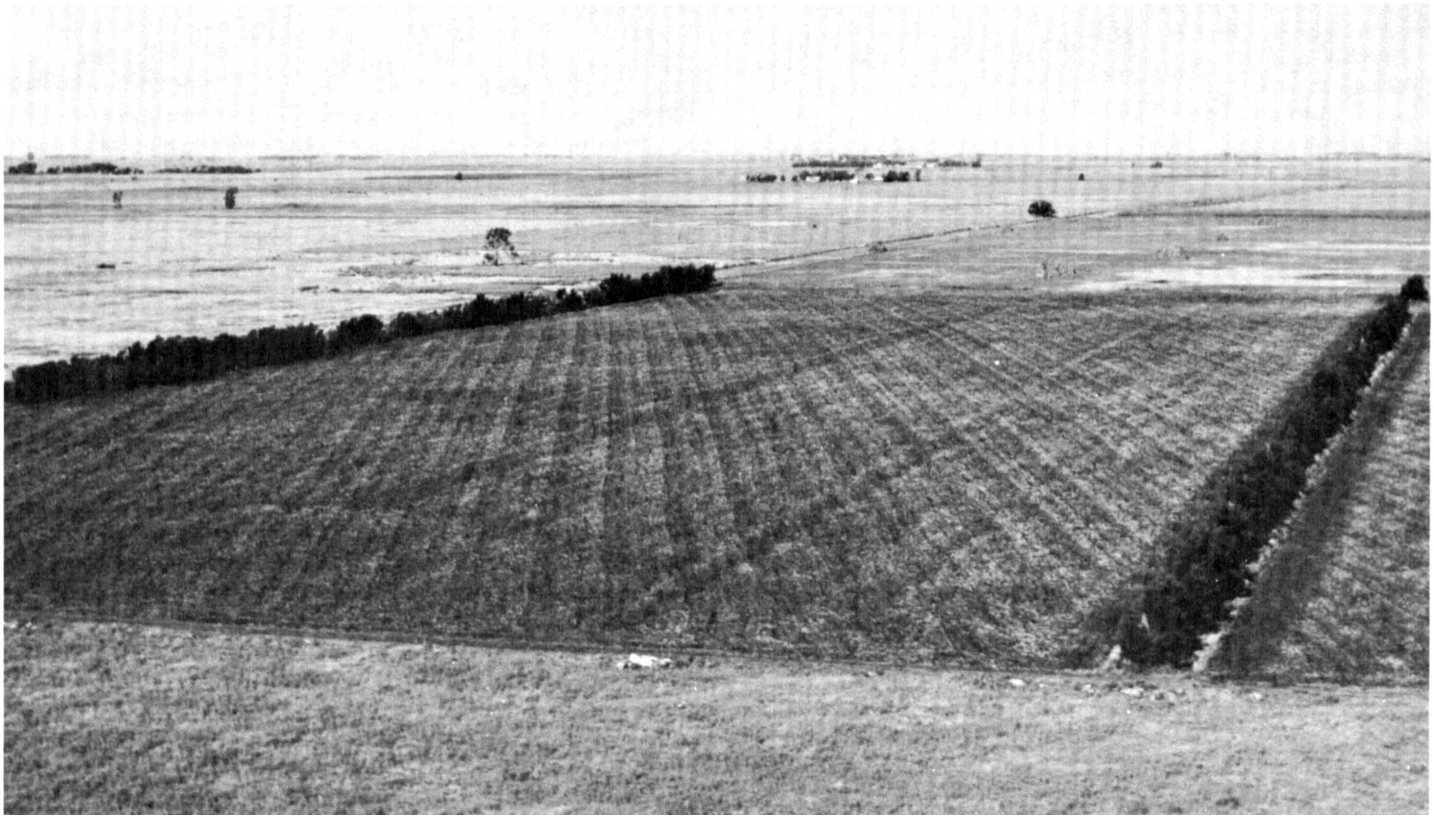

Figure 7.—Residue of small grain on the surface in an area of Houdek-Dudley complex, 0 to 3 percent slopes. Leaving crop residue on the surface improves tilth.

Because of the restricted permeability, the Houdek soil is only fairly well suited and the Dudley soil poorly suited to septic tank absorption fields. Enlarging the absorption area in these fields helps to overcome the slow absorption of liquid waste.

The Houdek soil is in capability subclass IIc, Silty range site; the Dudley soil is in capability subclass IVs, Claypan range site.

HdB—Houdek-Dudley complex, 3 to 6 percent slopes. These deep, undulating soils are on uplands. The well drained Houdek soil is on the smooth and slightly convex sides of ridges and knolls. The moderately well drained Dudley soil is in concave areas on the lower side slopes. In some areas scattered stones are on the surface. Areas are 5 to several hundred acres in size and are irregular in shape. They are 45 to 55 percent Houdek soil and 25 to 35 percent Dudley soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Houdek soil is dark grayish brown loam about 7 inches thick. The subsoil is grayish brown and light brownish gray, friable clay loam about 24 inches thick. It is calcareous in the lower part. The underlying material to a depth of 60 inches is pale yellow, calcareous clay loam.

Typically, the surface layer of the Dudley soil is dark gray silt loam about 7 inches thick. The subsurface layer is gray silt loam about 2 inches thick. The subsoil is very dark grayish brown, dark grayish brown, and grayish brown clay loam about 21 inches thick. It is very firm in the upper part and friable and calcareous in the lower part. The underlying material to a depth of 60 inches is light brownish gray and light yellowish brown, calcareous clay loam. Nests of gypsum crystals and accumulations of carbonate are in the lower part of the subsoil and in the underlying material.

Included with this soil in mapping are small areas of Beadle, Ethan, Hoven, Jerauld, Plankinton, and Prosper soils. These included soils make up less than 20 percent of any one mapped area. Beadle soils contain more clay in the subsoil than the Houdek soil. Their position on the landscape is similar to that of the Houdek soil. Ethan soils have carbonates within a depth of 9 inches. They are on the tops of ridges and on sharp slope breaks. The poorly drained Hoven and Plankinton soils are in depressions. Jerauld soils have accumulations of salts within a depth of 16 inches. Their position on the landscape is similar to that of the Dudley soil. The moderately well drained Prosper soils do not have a sodium affected subsoil. They are in swales and poorly defined drainageways.

The Houdek and Dudley soils are medium in fertility and moderate in content of organic matter. Available water capacity is high in both soils. Permeability is moderate in the subsoil of the Houdek soil and moderately slow in the underlying material. It is slow in the Dudley soil. Runoff is medium on the Houdek soil and slow on the Dudley soil. The shrink-swell potential is moderate in the Houdek soil and high in the Dudley soil.

About half of the acreage is cropland, and half is range. These soils are fairly well suited to cultivated crops. The Houdek soil is better suited than the Dudley soil. Root penetration is restricted in the Dudley soil because of the claypan subsoil and the high content of sodium salts. Crop residue management, stubble mulching, chiseling or subsoiling, and minimum tillage improve tilth and fertility, increase the content of organic matter and the water intake rate, and conserve moisture. Green manure crops improve tilth and increase the content of organic matter.

These soils are well suited to tame pasture and hay. The best suited tame pasture plants are those that can grow in a soil that has a claypan and contains sodium salts. Alfalfa, intermediate wheatgrass, and pubescent wheatgrass are examples.

These soils are well suited to range. The native vegetation dominantly is green needlegrass and western wheatgrass. Overused areas are dominated by western wheatgrass, saltgrass, blue grama, and weeds.

These soils are fairly well suited to windbreaks and environmental plantings. Except for those species that can grow well only if the supply of moisture is high, all climatically suited trees and shrubs grow well on the Houdek soil. No trees and shrubs grow well on the Dudley soil; optimum survival and vigor are unlikely.

Because of the shrink-swell potential, these soils are only fairly well suited to building site development. Backfilling with sandy material, providing foundation drains, and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling. Reinforcing foundations and footings also helps to prevent this damage.

Because of the restricted permeability, the Houdek soil is only fairly well suited and the Dudley soil poorly suited to septic tank absorption fields. Enlarging the absorption area of these fields helps to overcome the slow absorption of liquid waste.

The Houdek soil is in capability subclass IIe, Silty range site; the Dudley soil is in capability subclass IVs, Claypan range site.

HeB—Houdek-Ethan loams, 2 to 6 percent slopes. These deep, well drained, undulating soils are on uplands. The Houdek soil is on the smooth and slightly concave mid and lower side slopes. The Ethan soil is on ridgetops and sharp slope breaks. In some areas scattered glacial stones are on the surface. Areas are 5 to 1,000 acres in size and are irregular in shape. They are 45 to 60 percent Houdek soil and 20 to 35 percent Ethan soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Houdek soil is dark grayish brown loam about 7 inches thick. The subsoil is grayish brown and light brownish gray, friable clay loam about 24 inches thick. It is calcareous in the lower part. The underlying material to a depth of 60 inches is pale yellow, calcareous clay loam. In some areas the surface layer is fine sandy loam. In places the underlying material is stratified fine sandy loam, silt loam, and loam below a depth of 40 inches.

Typically, the surface layer of the Ethan soil is dark grayish brown loam about 5 inches thick. The subsoil is dark grayish brown and light brownish gray, friable loam about 17 inches thick. It is calcareous in the lower part. The underlying material to a depth of 60 inches is light yellowish brown, calcareous clay loam. In some areas the surface layer is less than 5 inches thick.

Included with these soils in mapping are small areas of Hoven, Plankinton, Prosper, and Tetonka soils. These included soils make up less than 20 percent of any one mapped area. The poorly drained Hoven, Plankinton, and Tetonka soils are in depressions. The moderately well drained Prosper soils are in swales and poorly defined drainageways.

The Houdek soil is medium in fertility and moderate in content of organic matter. The Ethan soil is low in fertility and in content of organic matter. Available water capacity is high in both soils. Permeability is moderate in the subsoil and moderately slow in the underlying material. Runoff is medium. The shrink-swell potential is moderate.

Most of the acreage is cropland. These soils are well suited to cultivated crops. Controlling erosion and conserving moisture are the major concerns of management. The high content of lime in the surface layer of the Ethan soil adversely affects the availability of plant nutrients. Stubble mulching, crop residue management, and minimum tillage help to control erosion, conserve moisture, and improve fertility and tilth. Contour farming and terraces can help to control erosion, but the slopes generally are too short or too irregular for contouring or terracing.

A cover of tame pasture plants or hay is effective in controlling erosion. These soils are well suited to tame pasture and hay. All climatically suited pasture plants grow well on the Houdek soil, but they do not grow so well on the Ethan soil because of the high content of carbonates. Alfalfa, intermediate wheatgrass, and smooth bromegrass are the best suited species.

These soils are well suited to range. The native vegetation dominantly is green needlegrass, bluestems, and western wheatgrass. Overused areas are dominated by western wheatgrass and other less palatable species. After continued overuse, short grasses, such as blue grama and Kentucky bluegrass, and weeds occupy the site.

These soils are fairly well suited to windbreaks and environmental plantings. Except for those species that can grow well only if the supply of moisture is high, all climatically suited trees and shrubs grow well on the Houdek soil. No trees or shrubs grow well on the Ethan soil.

These soils are fairly well suited to most kinds of building site development and sanitary facilities. The shrink-swell potential is a limitation on building sites, and the restricted permeability is a limitation in septic tank absorption fields. Backfilling with sandy material, providing foundation drains, and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling. Reinforcing foundations and footings also helps to prevent this damage. Enlarging the absorption area in septic tank absorption fields helps to overcome the slow absorption of liquid waste.

The Houdek soil is in capability subclass IIe, the Ethan soil in capability subclass IIIe; both soils are in Silty range site.

HeC—Houdek-Ethan loams, 6 to 9 percent slopes. These deep, well drained, gently rolling and moderately sloping soils are on ridges and along entrenched drainageways. The Houdek soil is on the broader ridgetops and on the smooth and concave mid and lower side slopes. The Ethan soil is on short, convex slopes and on narrow ridges, sharp slope breaks, and the upper side slopes. In places scattered glacial stones are on the surface. Areas are 5 to 100 acres in size and are irregular in shape. They are 40 to 55 percent Houdek soil and 25 to 40 percent Ethan soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Houdek soil is dark grayish brown loam about 7 inches thick. The subsoil is grayish brown and light brownish gray, friable clay loam about 24 inches thick. It is calcareous in the lower part. The underlying material to a depth of 60 inches is pale yellow, calcareous clay loam. In some areas the surface layer is fine sandy loam. In places the underlying material is stratified fine sandy loam, silt loam, and loam below a depth of 40 inches.

Typically, the surface layer of the Ethan soil is dark grayish brown loam. The subsoil is dark grayish brown and light brownish gray, friable loam about 17 inches thick. It is calcareous in the lower part. The underlying material to a depth of 60 inches is light yellowish brown, calcareous clay loam. In some areas the surface layer is less than 5 inches thick.

Included with these soils in mapping are small areas of Hoven, Plankinton, Prosper, and Tetonka soils. These included soils make up less than 20 percent of any one mapped area. The poorly drained Hoven, Plankinton, and Tetonka soils are in depressions. The moderately well drained Prosper soils are dark to a depth of more than 20 inches. They are in swales and drainageways.

The Houdek soil is medium in fertility and moderate in content of organic matter. The Ethan soil is low in fertility and in content of organic matter. Available water capacity is high in both soils. Permeablity is moderate in the subsoil and moderately slow in the underlying material. Runoff is medium. The shrink-swell potential is moderate.

About half of the acreage is cropland, and half is tame pasture. These soils are fairly well suited to cultivated crops. Controlling erosion and conserving moisture are the major concerns of management. The high content of lime in the surface layer of the Ethan soil adversely affects the availability of plant nutrients. Stubble mulching, crop residue management, minimum tillage, and grassed waterways help to control erosion, conserve moisture, and improve fertility and tilth. Contour farming and terraces also can help to control erosion, but the slopes in most areas are too short or too irregular for contouring and terracing.

A cover of tame pasture plants or hay is effective in controlling erosion. These soils are well suited to tame pasture and hay. The Ethan soil is less well suited than the Houdek soil because it has a high content of carbonates. Alfalfa, intermediate wheatgrass, and smooth bromegrass are the best suited species.

These soils are well suited to range. The native vegetation dominantly is green needlegrass and western wheatgrass. Overused areas are dominated by western wheatgrass and other less palatable species. After continued overuse, short grasses, such as blue grama and Kentucky bluegrass, and weeds occupy the site.

These soils are fairly well suited to windbreaks and environmental plantings. Except for those species that can grow well only if the moisture supply is high, all climatically suited trees and shrubs grow well on the Houdek soil. No trees or shrubs grow well on the Ethan soil. Planting windbreaks on the contour and applying a liberal amount of organic residue help to control erosion and increase the infiltration rate.

Because of the shrink-swell potential and the slope, these soils are only fairly well suited to most kinds of building site development. Buildings should be designed to conform to the natural slope of the land. Land shaping is needed in some areas. Backfilling with sandy material, providing foundation drains, and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling. Reinforcing foundations and footings also helps to prevent this damage.

Because of the slope and the restricted permeability, these soils are only fairly well suited to sanitary facilities. Enlarging the absorption area in septic tank absorption fields helps to overcome the slow absorption of liquid waste. Land shaping and installation of the distribution lines across the slope generally improve the efficiency of the absorption field.

The Houdek soil is in capability subclass IIIe, the Ethan soil in capability subclass IVe; both soils are in Silty range site.

HhA—Houdek-Hoven complex, 0 to 3 percent slopes. These deep, nearly level and level soils are on uplands characterized by many depressions. The well drained Houdek soil is on slight rises. Scattered glacial stones are on the surface in some areas. The poorly drained Hoven soil is in the depressions. It is ponded during periods of snowmelt and heavy rainfall. Areas are 15 to 200 acres in size and are irregular in shape. They are 45 to 55 percent Houdek soil and 25 to 35 percent Hoven soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Houdek soil is dark grayish brown loam about 7 inches thick. The subsoil is grayish brown and light brownish gray, friable clay loam about 24 inches thick. It is calcareous in the lower part. The underlying material to a depth of 60 inches is pale yellow, calcareous clay loam. In some areas it is stratified silt loam, sandy loam, and loam.

Typically, the surface layer of the Hoven soil is light gray silt loam about 4 inches thick. The subsoil is dark gray, very firm silty clay about 36 inches thick. It has gypsum crystals in the lower part. The underlying material to a depth of 60 inches is light brownish gray, calcareous clay loam. In some areas the subsoil contains less sodium.

Included with these soils in mapping are small areas of Dudley, Prosper, and Tetonka soils. These included soils make up less than 20 percent of any one mapped area. The moderately well drained Dudley soils are on the short, concave lower side slopes and in plane areas. The poorly drained Tetonka soils are in depressions. They do not have a sodium affected subsoil. The moderately well drained Prosper soils are in swales.

The Houdek and Hoven soils are medium in fertility and moderate in content of organic matter. Tilth is poor in the Hoven soil. Available water capacity is high in both soils. Permeability is moderate in the subsoil of the Houdek soil and moderately slow in the underlying material. It is very slow in the Hoven soil. A seasonal high water table is within a depth of 1.5 feet in the Hoven soil. As much as 1 foot of water ponds on this soil during some wet periods. Runoff is slow on the Houdek soil and is ponded on the Hoven soil. The shrink-swell potential is moderate in the Houdek soil and high in the Hoven soil.

About half of the acreage is cropland, and half is range. These soils are fairly well suited to cultivated crops. Late maturing crops, such as corn and grain sorghum, are better suited than small grain because in many areas the Hoven soil is not excessively wet late in the growing season. Conserving moisture in the Houdek soil and improving drainage and tilth in the Hoven soil are the main concerns of management. A surface drainage system helps to control ponding. Stubble mulching, crop residue management, and minimum tillage conserve moisture and improve tilth and fertility.

These soils are well suited to tame pasture and hay. All climatically suited pasture plants grow well on the Houdek soil. Alfalfa, intermediate wheatgrass, and smooth bromegrass are the best suited species. The only suitable pasture plants on the Hoven soil are those that grow well in areas where the supply of moisture is high. Western wheatgrass is the best suited species. Garrison creeping foxtail and reed canarygrass also are suited.

These soils are well suited to range. The native vegetation mainly is green needlegrass and western wheatgrass. Overused areas of the Houdek soil are dominated by western wheatgrass, blue grama, and Kentucky bluegrass. Saltgrass, foxtail barley, and weeds dominate overused areas of the Hoven soil. Many areas of the Hoven soil are potential pond sites.

The Houdek soil is well suited to windbreaks and environmental plantings. The Hoven soil, however, generally is unsuited because it is subject to ponding.

The Hoven soil generally is unsuitable as a site for buildings and septic tank absorption fields because of the ponding. The Houdek soil is only fairly well suited because the shrink-swell potential is a limitation on building sites and the restricted permeability is a limitation in septic tank absorption fields. Backfilling with sandy material, providing foundation drains, and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling. Reinforcing foundations and footings also helps to prevent this damage. Enlarging the absorption area in septic tank absorption fields helps to overcome the slow absorption of liquid waste.

The Houdek soil is in capability subclass IIc, Silty range site; the Hoven soil is in capability subclass VIs, Closed Depression range site.

HhB—Houdek-Hoven complex, 1 to 6 percent slopes. These deep, nearly level and undulating soils are on uplands characterized by many depressions. The well drained Houdek soil is on ridges and knolls. Scattered glacial stones are on the surface in some areas. The poorly drained Hoven soil is in the depressions. It is ponded during periods of snowmelt and heavy rainfall. Areas are 15 to 200 acres in size and are irregular in shape. They are 50 to 65 percent Houdek soil and 15 to 30 percent Hoven soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Houdek soil is dark grayish brown loam about 7 inches thick. The subsoil is grayish brown and light brownish gray, friable clay loam about 24 inches thick. It is calcareous in the lower part. The underlying material to a depth of 60 inches is pale yellow, calcareous clay loam. In some areas it is stratified silt loam, sandy loam, and loam.

Typically, the surface layer of the Hoven soil is light gray silt loam about 4 inches thick. The subsoil is dark gray, very firm silty clay about 36 inches thick. It has gypsum crystals in the lower part. The underlying material to a depth of 60 inches is light brownish gray, calcareous clay loam. In places the subsoil contains less sodium.

Included with these soils in mapping are small areas of Dudley, Ethan, Prosper, and Tetonka soils. These included soils make up less than 20 percent of any one mapped area. The moderately well drained Dudley soils are on the short, concave lower side slopes. Ethan soils have carbonates within 9 inches of the surface. They are on ridges above the Houdek soil. The poorly drained Tetonka soils do not have a sodium affected subsoil. They are in depressions. The moderately well drained Prosper soils are in swales.

The Houdek and Hoven soils are medium in fertility and moderate in content of organic matter. Tilth is poor in the Hoven soil. Available water capacity is high in both soils. Permeability is moderate in the subsoil of the Houdek soil and moderately slow in the underlying material. It is very slow in the Hoven soil. A seasonal high water table is within a depth of 1.5 feet in the Hoven soil. As much as 1 foot of water ponds on this soil during some wet periods. Runoff is medium on the Houdek soil and is ponded on the Hoven soil. The shrink-swell potential is moderate in the Houdek soil and high in the Hoven soil.

About half of the acreage is cropland, and half is range. These soils are fairly well suited to cultivated crops. Late maturing crops, such as corn and grain sorghum, are better suited than small grain because in many areas the Hoven soil is not excessively wet late in the growing season. Conserving moisture in the Houdek soil and improving drainage and tilth in the Hoven soil are the main concerns of management. A surface drainage system helps to control ponding. Stubble mulching, crop residue management, and minimum tillage conserve moisture and improve tilth and fertility. The slopes generally are too irregular for contouring or terracing.

These soils are well suited to tame pasture and hay. All climatically suited pasture plants grow well on the Houdek soil. Alfalfa, intermediate wheatgrass, and smooth bromegrass are the best suited species. Excess moisture limits the choice of plants to water tolerant species on the Hoven soil. Western wheatgrass is the best suited species. Garrison creeping foxtail and reed canarygrass also are suited.

These soils are well suited to range. The native vegetation mainly is green needlegrass and western wheatgrass. Overused areas of the Houdek soil are dominated by western wheatgrass, blue grama, and Kentucky bluegrass. Saltgrass, foxtail barley, and weeds dominate overused areas of the Hoven soil. Many areas of the Hoven soil are potential pond sites.

The Houdek soil is well suited to windbreaks and environmental plantings. The Hoven soil, however, generally is unsuited because it is subject to ponding.

The Hoven soil generally is unsuitable as a site for buildings and septic tank absorption fields because of the ponding. The Houdek soil is only fairly well suited because the shrink-swell potential is a limitation on building sites and the restricted permeability is a limitation in septic tank absorption fields. Backfilling with sandy material, providing foundation drains, and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling. Reinforcing foundations and footings also helps to prevent this damage. Enlarging the absorption area in septic tank absorption fields helps to overcome the slow absorption of liquid waste.

The Houdek soil is in capability subclass IIe, Silty range site; the Hoven soil is in capability subclass VIs, Closed Depression range site.

HoB—Houdek-Plankinton complex, 1 to 6 percent slopes. These deep, nearly level and undulating soils are on uplands characterized by many depressions. The well drained Houdek soil is on ridges and knolls. Scattered glacial stones are on the surface in some areas. The poorly drained Plankinton soil is in the depressions. It is ponded during periods of snowmelt and heavy rainfall. Areas are 15 to 200 acres in size and are irregular in shape. They are 50 to 65 percent Houdek soil and 15 to 30 percent Plankinton soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Houdek soil is dark grayish brown loam about 7 inches thick. The subsoil is grayish brown and light brownish gray, friable clay loam about 24 inches thick. It is calcareous in the lower part. The underlying material to a depth of 60 inches is pale yellow, calcareous clay loam. In places it is stratified silt loam, sandy loam, and loam.

Typically, the surface layer of the Plankinton soil is dark gray silt loam about 4 inches thick. The subsurface layer is light gray silt loam about 4 inches thick. The subsoil is about 32 inches of dark gray and grayish brown, firm silty clay and silty clay loam. It is calcareous in the lower part. The underlying material to a depth of 60 inches is light gray and light yellowish brown, calcareous clay loam. In some areas the surface layer and subsurface layer are thicker. In other areas there is no subsurface layer. In places the subsoil contains more sodium.

Included with these soils in mapping are small areas of Dudley, Ethan, and Prosper soils. These included soils make up less than 20 percent of any one mapped area. The moderately well drained Dudley soils are in concave areas on the lower side slopes. They have a sodium affected subsoil. Ethan soils have carbonates within 9 inches of the surface. They are on ridges above the Houdek soil. The moderately well drained Prosper soils are in swales and in poorly defined drainageways.

The Houdek and Plankinton soils are medium in fertility and moderate in content of organic matter. Tilth is poor in the Plankinton soil. Available water capacity is high in both soils. Permeability is moderate in the subsoil of the Houdek soil and moderately slow in the underlying material. It is slow or very slow in the Plankinton soil. A seasonal high water table is within a depth of 1 foot in the Plankinton soil. As much as 1 foot of water ponds on this soil during some wet periods. Runoff is medium on the Houdek soil and is ponded on the Plankinton soil. The shrink-swell potential is moderate in the Houdek soil and high in the Plankinton soil.

About half of the acreage is cropland, and half is range. These soils are fairly well suited to cultivated crops. Late maturing crops, such as corn and grain sorghum, are better suited than small grain because in many areas the Plankinton soil is not excessively wet late in the growing season. Controlling erosion and conserving moisture on the Houdek soil and improving drainage on the Plankinton soil are the main concerns of management. A surface drainage system helps to control ponding on the Plankinton soil. Stubble mulching, crop residue management, and minimum tillage help to control erosion, conserve moisture, and improve fertility and tilth in the Houdek soil. Slopes generally are too irregular for contouring or terracing.

A cover of tame pasture plants or hay is effective in controlling erosion. These soils are well suited to tame pasture and hay. All climatically suited pasture plants grow well on the Houdek soil. Alfalfa, intermediate wheatgrass, and smooth bromegrass are the best suited species. The only suitable pasture plants on the Plankinton soil are those that grow well in areas where the supply of moisture is high. Western wheatgrass is the best suited species. Garrison creeping foxtail and reed canarygrass also are suited.

These soils are well suited to range. The native vegetation mainly is green needlegrass and western wheatgrass. If the range is overused, western wheatgrass, blue grama, and Kentucky bluegrass are dominant on the Houdek soil and foxtail barley and weeds on the Plankinton soil. Many areas of the Plankinton soil are potential pond sites.

The Houdek soil is well suited to windbreaks and environmental plantings. The Plankinton soil, however, generally is unsuited because it is subject to ponding.

The Plankinton soil generally is unsuitable as a site for septic tank absorption fields and buildings because of the ponding. The Houdek soil is only fairly well suited because the shrink-swell potential is a limitation on building sites and the restricted permeability is a limitation in septic tank absorption fields. Backfilling with sandy material, providing foundation drains, and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling. Reinforcing foundations and footings also helps to prevent this damage. Enlarging the absorption area in septic tank absorption fields helps to overcome the slow absorption of liquid waste.

The Houdek soil is in capability subclass IIe, Silty range site; the Plankinton soil is in capability subclass IVw, Closed Depression range site.

HpA—Houdek-Prosper loams, 0 to 3 percent slopes. These deep, nearly level soils are on uplands. The well drained Houdek soil is on the slightly higher parts of the landscape. Scattered glacial stones are on the surface in some areas. The moderately well drained Prosper soil is in swales and poorly defined drainageways. It is occasionally flooded by runoff from adjacent uplands. Areas are 5 to 200 acres in size and are irregular in shape. They are 40 to 55 percent Houdek soil and 25 to 40 percent Prosper soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Houdek soil is dark grayish brown loam about 7 inches thick. The subsoil is grayish brown and light brownish gray, friable clay loam about 24 inches thick. It is calcareous in the lower part. The underlying material to a depth of 60 inches is pale yellow, calcareous clay loam. In places the surface layer is sandy loam. In some areas the underlying material is stratified sandy loam and silt loam.

Typically, the surface layer of the Prosper soil is dark gray loam about 8 inches thick. The subsurface layer is dark grayish brown loam about 4 inches thick. The subsoil is dark grayish brown, grayish brown, and light brownish gray, friable clay loam about 21 inches thick. It is calcareous in the lower part. The underlying material to a depth of 60 inches is light gray, calcareous clay loam.

Included with these soils in mapping are small areas of Dudley, Hoven, Plankinton, and Tetonka soils. These included soils make up less than 20 percent of any one mapped area. Dudley soils have a sodium affected subsoil. They are on short, concave side slopes. The poorly drained Hoven, Plankinton, and Tetonka soils are in depressions.

The Houdek soil is medium in fertility and moderate in content of organic matter. The Prosper soil is high in fertility and in content of organic matter. Available water capacity is high in both soils. Permeability is moderate in the subsoil and moderately slow in the underlying material. The Prosper soil has a seasonal high water table at a depth of 3 to 6 feet in the spring of most years. Runoff is slow on both soils. The shrink-swell potential is moderate.

Most of the acreage is cropland. These soils are well suited to cultivated crops. Conserving moisture is the main concern of management. Stubble mulching, crop residue management, and minimum tillage conserve moisture and improve fertility and tilth.

These soils are well suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well.

These soils are well suited to tame pasture and hay. All climatically suited pasture plants grow well. Alfalfa, intermediate wheatgrass, and smooth bromegrass are the best suited species.

These soils are well suited to range. The native vegetation dominantly is green needlegrass, big bluestem, and western wheatgrass. Overused areas are dominated by western wheatgrass and less palatable species. After continued overuse, Kentucky bluegrass and weeds dominate the site.

The Prosper soil generally is unsuitable as a site for buildings and septic tank absorption fields because it is subject to flooding. The Houdek soil is only fairly well suited because the shrink-swell potential is a limitation on building sites and the restricted permeability is a limitation in septic tank absorption fields. Backfilling with sandy material, providing foundation drains, and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling. Reinforcing foundations and footings also helps to prevent this damage. Enlarging the absorption area in the septic tank absorption fields helps to overcome the slow absorption of liquid waste.

The capability subclass is IIc; Houdek soil in Silty range site, Prosper soil in the Overflow range site.

Hv—Hoven silt loam. This deep, poorly drained, level soil is in depressions in the uplands. It is ponded during periods of snowmelt and heavy rainfall. Areas are 3 to 25 acres in size and are irregular in shape.

Typically, the surface layer is light gray silt loam about 4 inches thick. The subsoil is dark gray, very firm silty clay about 36 inches thick. It has gypsum crystals in the lower part. The underlying material to a depth of 60 inches is light brownish gray, calcareous clay loam. In places the subsoil contains less sodium.

Included with this soil in mapping are small areas of the moderately well drained DeGrey, Dudley, Onita, and Prosper soils. These soils make up less than 15 percent of any one mapped area. They are on the higher parts of the landscape.

The Hoven soil is medium in fertility and moderate in content of organic matter. Tilth is poor. Available water capacity is high. Permeability is very slow. A seasonal high water table is within a depth of 1.5 feet. As much as 1 foot of water ponds on the surface during some wet periods. Runoff is ponded. The shrink-swell potential is high.

Most areas support native grass. This soil is fairly well suited to range. The natural vegetation dominantly is western wheatgrass. Overused areas are dominated by saltgrass and weeds. Many areas are potential pond sites.

This soil generally is unsuited to cultivated crops and to windbreaks and environmental plantings. It is only fairly well suited to tame pasture and hay because the ponding and the sodium salts severely limit the number of suitable species. Garrison creeping foxtail and western wheatgrass are suitable.

This soil generally is unsuited to building site development and most sanitary facilities because of the ponding.

The capability subclass is VIs; Closed Depression range site.

Hw—Hoven-Plankinton silt loams. These deep, poorly drained, level soils are in depressions and drainageways in the uplands. The Hoven soil is near the edge of the depressions. The Plankinton soil is in the lower lying areas near the center of the depressions. Both soils are ponded during periods of snowmelt and heavy rainfall. Areas are 5 to 40 acres in size and are long and narrow. They are 35 to 50 percent Hoven soil and 30 to 45 percent Plankinton soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Hoven soil is light gray silt loam about 4 inches thick. The subsoil is dark gray, very firm silty clay about 36 inches thick. It has gypsum crystals in the lower part. The underlying material to a depth of 60 inches is light brownish gray, calcareous clay loam.

Typically, the surface layer of the Plankinton soil is dark gray silt loam about 4 inches thick. The subsurface layer is light gray silt loam about 4 inches thick. The subsoil is about 32 inches of dark gray and grayish brown, firm silty clay and silty clay loam. It is calcareous in the lower part. The underlying material to a depth of 60 inches is light gray and light yellowish brown, calcareous clay loam.

Included with these soils in mapping are small areas of the well drained Beadle and moderately well drained DeGrey, Dudley, Onita, and Prosper soils. These included soils make up less than 20 percent of any one mapped area. They are on the higher parts of the landscape and in swales between depressions.

The Hoven and Plankinton soils are medium in fertility and in content of organic matter. Tilth is poor in both soils. Available water capacity is high. Permeability is very slow in the Hoven soil and slow or very slow in the Plankinton soil. A seasonal high water table is within a depth of 1.5 feet in the Hoven soil and 1 foot in the Plankinton soil. As much as 1 foot of water ponds on the surface during some wet periods. Runoff is ponded. The shrink-swell potential is high.

Most areas support native grass. These soils are fairly well suited to range. The natural vegetation dominantly is western wheatgrass. Overused areas are dominated by saltgrass and weeds. Many areas are potential pond sites.

Many small areas are cultivated along with adjacent areas. These soils generally are unsuited to cultivated crops and to windbreaks and environmental plantings. They are only fairly well suited to tame pasture and hay because the ponding and the high content of salts severely limit the number of suitable species. Garrison creeping foxtail and western wheatgrass are suitable.

These soils generally are unsuitable as sites for buildings and septic tank absorption fields because of the ponding.

The Hoven soil is in capability subclass VIs, the Plankinton soil in capability subclass IVw; both soils are in Closed Depression range site.

La—Lane silty clay loam. This deep, moderately well drained, nearly level soil is on terraces and alluvial fans. Areas are 40 to 400 acres in size and are irregular in shape. Slopes are smooth and slightly concave.

Typically, the surface layer is very dark gray silty clay loam about 8 inches thick. The subsoil is very dark grayish brown and grayish brown, firm silty clay about 27 inches thick. It is calcareous in the lower part. The underlying material to a depth of 60 inches is light yellowish brown and light brownish gray, calcareous silty clay. In places the depth to carbonates is more than 22 inches.

Included with this soil in mapping are small areas of Beadle, Dudley, Houdek, Hoven, and Plankinton soils. These soils make up less than 15 percent of any one mapped area. The Beadle and Houdek soils formed in glacial till. They are well drained and are slightly higher on the landscape than the Lane soil. Dudley soils have a sodium affected subsoil. They are on short, concave side slopes. The poorly drained Hoven and Plankinton soils are in depressions.

The Lane soil is high in fertility and in content of organic matter. Tilth is fair. Available water capacity is high. Permeability is slow. Runoff also is slow. The shrink-swell potential is high.

Most of the acreage is cropland. This soil is well suited to cultivated crops. Conserving moisture is the main concern of management. Tilling when the soil is wet causes compaction of the subsoil. Stubble mulching, crop residue management, and minimum tillage conserve moisture. Returning crop residue to the soil improves fertility and tilth. Chiseling or subsoiling increases the water intake rate.

This soil is well suited to windbreaks and environmental plantings. Except for those species that can grow well only if the supply of moisture is high, all climatically suited trees and shrubs grow well.

This soil is well suited to tame pasture and hay. Alfalfa, intermediate wheatgrass, and smooth bromegrass grow well.

This soil is well suited to range. The native vegetation dominantly is green needlegrass and western wheatgrass. Overused areas are dominated by western wheatgrass. After continued overuse, blue grama and weeds occupy the site.

Because of the shrink-swell potential, this soil is poorly suited to most kinds of building site development. Backfilling with sandy material, providing foundation drains, and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling. Reinforcing foundations and footings also helps to prevent this damage.

Because of the restricted permeability, this soil is poorly suited to septic tank absorption fields. Enlarging the absorption area helps to overcome the slow absorption of liquid waste.

The capability subclass is IIs; Clayey range site.

MaA—Millboro Variant silty clay, 0 to 2 percent slopes. This deep, well drained, nearly level soil is on alluvial fans and terraces. Areas are 10 to 300 acres in size and are irregular in shape. Slopes typically are long and are smooth or slightly concave.

Typically, the surface layer is dark gray silty clay about 5 inches thick. The subsoil is grayish brown and light brownish gray, firm, calcareous clay about 26 inches thick. The underlying material to a depth of 60 inches is light brownish gray, calcareous clay and clayey mudstone. It has gypsum crystals in the lower part.

Included with this soil in mapping are small areas of the moderately well drained Lane and Onita soils. These soils make up less than 15 percent of any one mapped area. The Lane soils are on terraces, and the Onita soils are in swales.

The Millboro Variant soil is medium in fertility and moderate in content of organic matter. Tilth is poor. Available water capacity is moderate. Permeability is slow in the upper part of the soil and very slow in the mudstone. Runoff is slow. The shrink-swell potential is high.

Most of the acreage is cropland. This soil is well suited to cultivated crops. Tillage is difficult because of the high content of clay. Improving tilth, increasing the water intake rate, and controlling soil blowing are the main concerns of management. Measures that conserve moisture and improve fertility also are needed. Stubble mulching, crop residue management, chiseling or subsoiling, and minimum tillage help to control soil blowing, increase the water intake rate, and conserve moisture. Field windbreaks also help to control soil blowing. Returning crop residue to the soil improves fertility and tilth.

This soil is fairly well suited to windbreaks and environmental plantings. Most climatically suited trees and shrubs grow well.

A cover of tame pasture plants or hay is effective in controlling soil blowing. This soil is well suited to tame pasture and hay. Alfalfa, intermediate wheatgrass, and smooth bromegrass are the best suited species. Restricted grazing during wet periods helps to prevent compaction of the surface layer.

This soil is well suited to range. The native vegetation dominantly is green needlegrass and western wheatgrass. Overused areas are dominated by western wheatgrass. After continued overuse, blue grama and weeds occupy the site.

Because of the shrink-swell potential, this soil is poorly suited to most kinds of building site development. Backfilling with sandy material, providing foundation drains, and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling. Reinforcing foundations and footings also helps to prevent this damage.

Septic tank absorption fields do not function satisfactorily in this soil because of the very restricted permeability. The soil is suitable, however, as a site for sewage lagoons.

The capability subclass is IIs; Clayey range site.

MaB—Millboro Variant silty clay, 2 to 6 percent slopes. This deep, well drained, gently sloping soil is on alluvial fans and terraces. Areas are 10 to 180 acres in size and are long and narrow. Slopes generally are short and slightly convex.

Typically, the surface layer is dark gray silty clay about 5 inches thick. The subsoil is grayish brown and light brownish gray, firm, calcareous clay about 26 inches thick. The underlying material to a depth of 60 inches is light brownish gray, calcareous clay and clayey mudstone. It has gypsum crystals in the lower part. In places the underlying material is shaly glacial till.

Included with this soil in mapping are small areas of Houdek and Onita soils. These soils make up less than 15 percent of any one mapped area. Houdek soils contain less clay and more sand in the subsoil than the Millboro Variant soil. They are on uplands. Onita soils are moderately well drained and are in drainageways.

The Millboro Variant soil is medium in fertility and moderate in content of organic matter. Tilth is poor. Available water capacity is moderate. Permeability is very slow. Runoff is medium. The shrink-swell potential is high.

Most of the acreage is cropland. This soil is fairly well suited to cultivated crops. Tillage is difficult because of the high content of clay. Controlling erosion and soil blowing, increasing the water intake rate, and conserving moisture are the main concerns of management. Stubble mulching, crop residue management, minimum tillage, chiseling or subsoiling, and contour farming help to control erosion and soil blowing, increase the water intake rate, conserve moisture, and improve fertility and tilth. Field windbreaks also help to control soil blowing.

This soil is fairly well suited to windbreaks and environmental plantings. Most climatically suited trees and shrubs grow well.

A cover of tame pasture plants or hay is effective in controlling erosion and soil blowing. This soil is well suited to tame pasture and hay. Alfalfa, intermediate wheatgrass, and smooth bromegrass are the best suited species. Restricted grazing during wet periods helps to prevent compaction of the surface layer.

This soil is well suited to range. The native vegetation dominantly is western wheatgrass and green needlegrass. Overused areas are dominated by western wheatgrass. After continued overuse, blue grama and weeds occupy the site.

Because of the shrink-swell potential, this soil is poorly suited to most kinds of building site development. Backfilling with sandy material, providing foundation drains, and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling. Reinforcing foundations and footings also helps to prevent this damage.

Septic tank absorption fields do not function satisfactorily in this soil because of the very restricted permeability. The soil is suitable, however, as a site for sewage lagoons.

The capability subclass is IIIe; Clayey range site.

Oa—Onita silt loam. This deep, moderately well drained, nearly level soil is in swales and poorly defined drainageways on uplands. It is frequently flooded by runoff from adjacent uplands. Areas are 5 to 45 acres in size and are long and narrow.

Typically, the surface layer is very dark gray silt loam about 12 inches thick. The subsoil is about 35 inches of very dark gray and grayish brown, firm silty clay loam and silty clay. The underlying material to a depth of 60 inches is light brownish gray silty clay loam. In places loam and clay loam glacial till is below a depth of 40 inches. In some areas carbonates are near the surface.

Included with this soil in mapping are small areas of DeGrey, Eakin, Highmore, Hoven, and Plankinton soils. These soils make up less than 15 percent of any one mapped area. The well drained Eakin and Highmore soils are slightly higher on the landscape than the Onita soil. DeGrey soils have a sodium affected subsoil. They are on short, concave side slopes. The poorly drained Hoven and Plankinton soils are in depressions.

The Onita soil is high in fertility and in content of organic matter. Available water capacity is high. Permeability is moderately slow. A seasonal high water table is at a depth of 2.5 to 6.0 feet in the spring of most years. Runoff is slow. The shrink-swell potential is high.

Most of the acreage is cropland. This soil is well suited to cultivated crops. Conserving moisture is the main concern of management. Stubble mulching, crop residue management, and minimum tillage conserve moisture and improve fertility and tilth.

This soil is well suited to tame pasture and hay. All climatically suited pasture plants, such as alfalfa, intermediate wheatgrass, and smooth bromegrass, grow well.

This soil is well suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well.

This soil is well suited to range. The native vegetation dominantly is big bluestem. Overused areas are dominated by western wheatgrass and Kentucky bluegrass. After continued overuse, Kentucky bluegrass and weeds occupy the site.

Because of the flooding, this soil is poorly suited to building site development and sanitary facilities.

The capability subclass is IIc; Overflow range site.

Pg—Pits, gravel. These areas are open excavations, 5 to 30 feet deep, from which sand and gravel have been removed. They are irregular in shape and range from 2 to 50 acres in size. Slopes are uneven and broken. They range from nearly level on the pit bottoms to almost vertical on the rims. Some of the pit bottoms are covered with water.

The pit bottoms typically are sand and gravel, but they are loam or clay loam glacial till or silty glacial drift where all of the sand and gravel has been removed. Mounds of mixed loamy overburden are on the edges of the areas. The bottoms and sides support little or no vegetation during periods when the pits are used.

Most gravel pits are used only as a source of sand and gravel for construction purposes. Some provide limited wildlife habitat. Abandoned gravel pits can be restored to range, tame pasture, or cropland if reclamation measures are applied. These measures include shaping the areas and using the mounds of overburden material as topsoil dressing. Applying fertilizer as needed helps to establish the range or pasture.

The capability subclass is VIIIs; no range site is assigned.

Pt—Plankinton-Prosper complex. These deep, level and nearly level soils are in or near depressions and drainageways in the uplands. The poorly drained Plankinton soil is on the lower parts of the drainageways and depressions. It is ponded by runoff from adjacent uplands. The moderately well drained Prosper soil is in swales between depressions and on the higher parts of the landscape. It is frequently flooded. Areas are 5 to 40 acres in size and are long and narrow. They are 50 to 60 percent Plankinton soil and 20 to 30 percent Prosper soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Plankinton soil is dark gray silt loam about 4 inches thick. The subsurface layer is light gray silt loam about 4 inches thick. The subsoil is about 32 inches of dark gray and grayish brown, firm silty clay and silty clay loam. It is calcareous in the lower part. The underlying material to a depth of 60 inches is light gray and light yellowish brown, calcareous clay loam. In some plowed areas the surface layer is silty clay loam or silty clay. In places it is more than 4 inches thick. In some areas the subsoil contains more sodium.

Typically, the surface layer of the Prosper soil is dark gray loam about 8 inches thick. The subsurface layer is dark grayish brown loam about 4 inches thick. The subsoil is dark grayish brown, grayish brown, and light brownish gray clay loam about 21 inches thick. It is calcareous in the lower part. The underlying material to a depth of 60 inches is light gray, calcareous clay loam. In places gravelly sand is below a depth of 40 inches.

Included with these soils in mapping are small areas of Clarno, Dimo, and Houdek soils. These included soils make up less than 20 percent of any one mapped area. The well drained Clarno and Houdek soils and the somewhat poorly drained Dimo soils are near the edge of the mapped areas.

The Plankinton soil is medium in fertility and moderate in content of organic matter. The Prosper soil is high in fertility and in content of organic matter. Tilth is poor in the Plankinton soil. Available water capacity is high in both soils. Permeability is slow or very slow in the Plankinton soil. It is moderate in the subsoil of the Prosper soil and moderately slow in the underlying material. A seasonal high water table is at a depth of 3 to 6 feet in the Prosper soil and is within a depth of 1 foot in the Plankinton soil. As much as 1 foot of water ponds on the Plankinton soil during some wet periods. Runoff is ponded on the Plankinton soil and is slow on the Prosper soil. The shrink-swell potential is high in both soils.

Most areas are cropped along with adjacent areas in the uplands. These soils are poorly suited to cultivated crops because of the ponding on the Plankinton soil. The main concerns of management are removing excess water and improving tilth. Returning crop residue to the soil and delaying tillage when the soil is wet improves tilth. A surface drainage system and measures that control the runoff from adjacent soils are needed.

These soils are fairly well suited to tame pasture or hay. Only the water tolerant pasture plants grow well in undrained areas of the Plankinton soil. Garrison creeping foxtail, reed canarygrass, and western wheatgrass are examples. Alfalfa, intermediate wheatgrass, and smooth bromegrass are suitable if the soils are drained.

These soils are fairly well suited to range. The native vegetation dominantly is western wheatgrass. Overused areas are dominated by less productive short grasses. After continued overuse, Kentucky bluegrass, saltgrass, and weeds occupy the site. Many areas are potential pond sites.

The Prosper soil is well suited to windbreaks and environmental plantings, but the Plankinton soil is poorly suited. No trees and shrubs grow well on the Plankinton soil; optimum survival and vigor are unlikely. All climatically suited trees and shrubs grow well on the Prosper soil.

These soils generally are unsuitable as sites for buildings and septic tank absorption fields because of the ponding and the flooding.

The Plankinton soil is in capability subclass IVw, Closed Depression range site; the Prosper soil is in capability subclass IIc, Overflow range site.

TaC—Talmo gravelly loam, 2 to 15 percent slopes. This excessively drained, undulating to rolling soil is in old gravel pits on uplands and stream terraces. It is very shallow to gravelly sand. Areas generally are open excavations from which several feet of sand and gravel have been removed. They are 5 to 40 acres in size and are irregular in shape. Slopes are short and complex.

Typically, the surface layer is dark gray gravelly loam about 9 inches thick. The underlying material to a depth of 60 inches is multicolored, calcareous gravelly sand. In places the surface layer is gravelly sand.

Included with this soil in mapping are small areas where all of the gravelly sand has been removed and the loam, clay loam, and silty clay loam underlying material is exposed. Also included are mounds of overburden on the edges of some areas.

The Talmo soil is low in fertility and in content of organic matter. Available water capacity is low. Permeability is rapid. Water ponds in the deep depressions where the underlying material is glacial till. Runoff is slow.

Most areas support native grasses. This soil is poorly suited to range. The native vegetation mainly is blue grama and needleandthread. Overused areas are dominated by threadleaf sedge, blue grama, and weeds.

This soil generally is unsuited to cultivated crops and to tame pasture and hay and windbreaks and environmental plantings. Trees and shrubs can be established for special purposes if they are planted by hand and given special care.

This soil generally is unsuitable as a site for most buildings and sanitary facilities because of the slope and the likelihood that effluent will pollute shallow ground water.

The capability subclass is VIIs; Very Shallow range site.

TdE—Talmo-Delmont complex, 15 to 40 percent slopes. These moderately steep and steep soils are on ridges and along well defined drainageways in the uplands. They are very shallow and shallow to gravelly sand. The excessively drained Talmo soil is on narrow ridges, on sharp slope breaks, and along entrenched drainageways. The somewhat excessively drained

Delmont soil is on the smooth or convex mid and lower side slopes and on the broader ridgetops. Areas are 5 to 100 acres in size and are irregular in shape. They are 50 to 65 percent Talmo soil and 15 to 30 percent Delmont soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Talmo soil is very dark gray gravelly loam about 9 inches thick. The underlying material to a depth of 60 inches is multicolored, calcareous gravelly sand. In places glacial till is below a depth of 20 inches.

Typically, the surface layer of the Delmont soil is dark gray loam about 5 inches thick. The subsoil is dark gray, very friable loam about 11 inches thick. The underlying material to a depth of 60 inches is multicolored, calcareous gravelly sand. In places the depth to gravelly sand is 20 inches or more.

Included with these soils in mapping are small areas of Betts, Eakin, Ethan, and Houdek soils. These included soils make up less than 20 percent of any one mapped area. They are not underlain by gravelly sand. Betts and Ethan soils are on the steeper convex side slopes. Eakin and Houdek soils are on the lower concave parts of the side slopes.

Fertility is low in the Talmo soil and medium in the Delmont soil. The content of organic matter is low in the Talmo soil and moderate in the Delmont soil. Available water capacity is low in both soils. Permeability is rapid in the Talmo soil. It is moderate in the subsoil of the Delmont soil and rapid in the underlying material. Runoff is slow on the Talmo soil and medium on the Delmont soil.

Most areas support native grass. These soils are poorly suited to range. The native vegetation dominantly is needleandthread and, to a lesser extent, blue grama, hairy grama, and threadleaf sedge. Overused areas are dominated by threadleaf sedge, blue grama, and forbs.

These soils generally are unsuited to cultivated crops and to tame pasture and hay and windbreaks and environmental plantings. Trees and shrubs can be established for special purposes if they are planted by hand and given special care.

These soils generally are unsuitable as sites for most buildings and sanitary facilities because of the moderately steep and steep slope. They are a probable source of gravelly sand for use as road construction material.

The Talmo soil is in capability subclass VIIs, Very Shallow range site; the Delmont soil is in capability subclass VIe, Shallow to Gravel range site.

Te—Tetonka silt loam. This deep, poorly drained, level soil is in depressions in the uplands. It is ponded during periods of snowmelt or heavy rainfall. Areas are 5 to 20 acres in size and are oval.

Typically, the surface layer is gray silt loam about 7 inches thick. The subsurface layer is light gray silt loam about 5 inches thick. The subsoil is about 32 inches thick. It is gray, firm clay over light gray, friable, calcareous clay loam. The underlying material to a depth of 60 inches is light olive gray, calcareous clay loam. In places the surface layer is less than 6 inches thick. In some areas the soil is underlain by gravelly sand below a depth of 45 inches. In other areas it does not have a subsurface layer.

Included with this soil in mapping are small areas of Dimo, Hoven, and Prosper soils. These soils make up less than 15 percent of any one mapped area. The somewhat poorly drained Dimo soils and the moderately well drained Prosper soils are on small mounds near the edge of the depressions. Hoven soils have a sodium affected subsoil. Their position on the landscape is similar to that of the Tetonka soil.

The Tetonka soil is medium in fertility and moderate in content of organic matter. Available water capacity is high. Permeability is very slow. A seasonal high water table is within a depth of 1 foot. As much as 1 foot of water ponds on the surface during some wet periods. Runoff is ponded. The shrink-swell potential is high.

Most areas support native grass. This soil is fairly well suited to range. The native vegetation dominantly is prairie cordgrass, reedgrasses, and sedges. Overused areas are dominated by foxtail barley, spike sedge, and rushes. Many areas are potential pond sites.

Unless it is drained, this soil is poorly suited to cultivated crops and to windbreaks and environmental plantings. The best suited crops are those that mature late in the growing season. The main concerns of management are improving drainage and tilth. In some undrained areas, crops drown and tillage is delayed for long periods.

This soil is well suited to tame pasture and hay. Unless the soil is drained, however, only water tolerant pasture plants grow well. Garrison creeping foxtail and reed canarygrass are the best suited species. In drained areas all climatically suited pasture plants are suitable.

This soil generally is unsuitable as a site for buildings and septic tank absorption fields because of the ponding.

The capability subclass is IVw; Wet Meadow range site.

Wo—Worthing silty clay loam. This deep, very poorly drained, level soil is in depressions in the uplands. It is ponded during periods of snowmelt or heavy rainfall. Areas are 5 to 30 acres in size and are irregular in shape.

Typically, the surface layer is dark gray silty clay loam about 8 inches thick. The subsoil is dark gray and gray, firm silty clay about 28 inches thick. The underlying material to a depth of 60 inches is light gray, calcareous silty clay loam. In places the soil has a light gray subsurface layer. In some areas the surface layer is less than 8 inches thick.

Included with this soil in mapping are small areas of Durrstein, Hoven, Onita, and Prosper soils. These soils make up less than 15 percent of any one mapped area. Durrstein and Hoven soils have a sodium affected subsoil. Their position on the landscape is similar to that of the Worthing soil. The moderately well drained Onita and Prosper soils are near the edge of the depressions.

The Worthing soil is high in fertility and in content of organic matter. Available water capacity is high. Permeability is slow. A seasonal high water table is within a depth of 1 foot. As much as 1 foot of water ponds on the surface during some wet periods. Runoff is ponded. The shrink-swell potential is high.

Most areas support native grass. This soil is fairly well suited to range. The native vegetation dominantly is slough sedge and rivergrass. Overused areas are dominated by spike sedge and by unpalatable grasses and weeds. Many areas are potential pond sites.

This soil generally is unsuited to cultivated crops and to windbreaks and environmental plantings and is fairly well suited to tame pasture and hay. Because the soil is frequently ponded, the number of suitable crops and pasture plants is severely limited. Garrison creeping foxtail and reed canarygrass are the best suited pasture plants.

This soil generally is unsuitable as a site for buildings and septic tank absorption fields because of the ponding.

The capability subclass is Vw; Shallow Marsh range site.

Wp—Worthing silty clay loam, ponded. This deep, very poorly drained, level soil is in depressions in the uplands. It is ponded most of the year. Areas are 5 to 200 acres in size and are circular.

Typically, the surface layer is dark gray silty clay loam about 8 inches thick. The subsoil is dark gray and gray, firm silty clay about 28 inches thick. The underlying material to a depth of 60 inches is light gray, calcareous silty clay loam. In some places a thin, partly decomposed organic layer is at the surface. In other places the subsoil and underlying material have accumulations of salts. In some areas layers of gravelly sand are in the underlying material. In other areas the soil has a light gray subsurface layer. In places the surface layer is less than 8 inches thick.

Included with this soil in mapping are small areas of the calcareous Arlo soils and the very poorly drained Durrstein and Hoven soils. These soils make up less than 15 percent of any one mapped area. They are in the slightly higher areas near the edge of the depressions.

The Worthing soil is high in fertility and in content of organic matter. Available water capacity is high. Permeability is slow. A seasonal high water table is within a depth of 0.5 foot. As much as 3.0 feet of water ponds on the surface during some wet periods. Runoff is ponded. The shrink-swell potential is high.

Most areas support native vegetation and are used as wetland wildlife habitat (fig. 8). The natural plant cover is a luxuriant stand of bulrushes, reedgrasses, and sedges. Many areas are potential pond sites.

This soil generally is unsuited to cultivated crops and to tame pasture and hay and windbreaks and environmental plantings. It is unsuitable as a site for buildings and sanitary facilities because of the ponding.

The capability subclass is VIIIw; no range site is assigned.

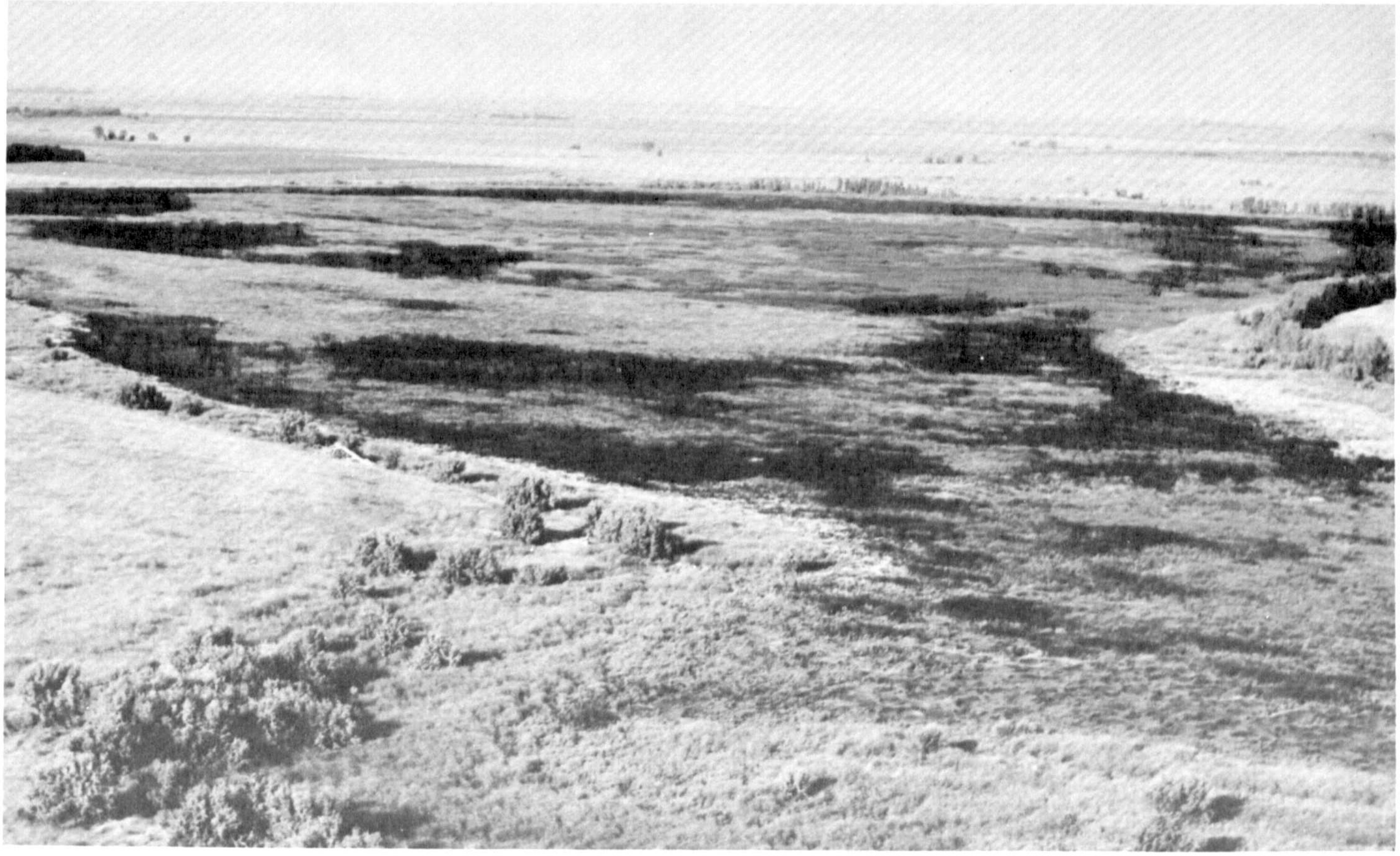

Figure 8.—An area of Worthing silty clay loam, ponded, used as habitat for wetland wildlife.

use and management of the soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

crops and pasture

Gary D. Kruse, district conservationist, Soil Conservation Service, helped prepare this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed soil map units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

More than half of the acreage in Aurora County is used for cultivated crops or for tame pasture and hay. The major crops are alfalfa, corn, oats, and grain sorghum. Barley and wheat are also grown. Wheat is grown for grain, alfalfa is harvested mainly for hay, corn is harvested for both silage and grain, and oats is grown as a cash crop and as livestock feed.

The potential of the soils in Aurora County for increased crop production is good. About 60,000 acres of potentially good cropland is currently used as range, 11,000 acres as pasture, and 40,000 acres as hayland. In addition to the reserve productive capacity represented by this land, food production could also be increased considerably by extending the latest crop production technology to all cropland in the county. This soil survey can greatly facilitate the application of such technology.

Soil erosion is the major problem on about 45 percent of the cropland, hayland, and pasture in Aurora County. If the slope is more than 2 percent, erosion is a hazard on Beadle, Blendon, Clarno, Delmont, Eakin, Enet, Ethan, Houdek, Millboro Variant, and other soils. Blendon and Millboro Variant soils also are subject to soil blowing.

Loss of the surface layer through erosion is damaging for two reasons. First, productivity is reduced as the surface layer is lost and part of the subsoil is incorporated into a plow layer. Loss of the surface layer is especially damaging on clayey soils, such as the Millboro Variant; on soils having a claypan subsoil, such as DeGrey and Dudley; and on soils having a thin surface layer, such as Betts and Ethan. Erosion also reduces the productivity of soils that tend to be droughty, such as Alwilda and Enet soils. Second, erosion results in sediment entering streams and lakes. Controlling erosion minimizes the pollution of streams and lakes by sediment and improves water quality for fish and wildlife, recreation, and municipal use.

A cropping system that keeps a plant cover on the soil for extended periods holds soil losses to amounts that will not reduce fertility. In areas where crops do not protect the soil, careful management of crop residue is essential. On livestock farms, including legumes and forage crops in the cropping system reduces the risk of erosion in sloping areas and provides nitrogen and improves tilth for the following crop.

Slopes are so short and irregular that contour farming and terracing are not practical in most areas of the sloping Ethan, Houdek, and Clarno soils. On these soils a cropping system that keeps a substantial plant cover on the surface is needed to control erosion.

Minimizing tillage and leaving crop residue on the surface increase the infiltration rate and reduce the risks of runoff and erosion. Together with grassed waterways, these practices are suitable on most soils in the survey area.

Soil blowing is a slight to severe hazard on many of the soils in the county. The hazard is especially severe on the Blendon and Millboro Variant soils. Soil blowing can damage these soils in a few hours if winds are strong and the soils are dry and have no plant cover or surface mulch. An adequate plant cover, a cover of crop residue, and a rough surface minimize soil blowing on these soils. Windbreaks of suited trees and shrubs or strips of unharvested crops also are effective in reducing the risk of soil blowing.

Information about the measures that control erosion on each kind of soil is contained in the Technical Guide, available in local offices of the Soil Conservation Service.

Soil drainage is the major management need on the poorly drained Clamo, Hoven, Plankinton, and Tetonka soils and on the very poorly drained Worthing soils. Unless artificially drained, these soils are so wet that crops frequently are damaged. Open ditches help to remove excess water if outlets are available. Controlling runoff on adjacent slopes also helps to reduce wetness.

The moderately well drained Bon, Onita, and Prosper and somewhat poorly drained Dimo soils are on stream terraces, flood plains, and flats and in upland swales that receive additional moisture when water runs off higher lying adjacent soils. During wet years tillage and planting are delayed in the spring, but in most years drainage is adequate and the additional moisture generally is beneficial for crops. Artificial drainage is rarely needed on these soils.

Soil fertility should be kept at a level that permits optimum yields. The amounts and kinds of fertilizer needed on Ethan and other soils that have a high content of lime in the surface layer generally differ from the amounts and kinds needed on soils that do not have lime in the surface layer. Including grasses and legumes in the cropping system improves fertility in these soils. On all soils additions of fertilizer should be based on the results of soil tests, on the need of the crop, and on the expected level of yields. The Cooperative Extension Service can help in determining the kinds and amounts of fertilizer needed.

Soil tilth is an important factor in the germination of seeds and in the infiltration of water into the soil. Soils with good tilth are granular and porous. Tilth is poor in clayey soils, such as the Millboro Variant, and in claypan soils, such as DeGrey and Dudley. These soils dry slowly in the spring and are difficult to till. If they are farmed when wet, they tend to be very cloddy when dry. As a result, preparing a good seedbed is difficult. Timely tillage, inclusion of grasses and legumes in the cropping system, crop residue management, and applications of animal manure improve tilth and increase the rate of water intake.

Field crops suited to the soils and climate of the survey area include small grain and row crops. Wheat and oats are the main small grain crops. Barley is grown on a smaller acreage. Corn is the main row crop. A considerable acreage is planted to sorghum. In many areas row crops are harvested for silage. The acreage planted to sunflowers is increasing.

The deep, well drained or moderately well drained soils in the survey area are suited to all of the crops commonly grown in the county. Examples are Beadle, Bon, Clarno, Eakin, Highmore, Houdek, Lane, and Onita soils.

Alwilda, Delmont, and Enet, soils are better suited to early maturing small grain than to deeper rooted crops, such as corn and alfalfa, because the porous underlying material limits the depth to which roots can penetrate and the available water capacity. These soils are droughty late in the summer. DeGrey, Dudley, and other soils having a claypan subsoil also are better suited to early maturing small grain.

Pasture plants best suited to the climate and most of the soils in the survey area include alfalfa, intermediate wheatgrass, and smooth bromegrass. Alwilda, Delmont, Enet, and other soils that tend to be droughty and Ethan and other soils that have lime near the surface are well suited to crested wheatgrass. Bunch-type species, such as crested wheatgrass, should not be planted in areas where the slope is more than 6 percent because erosion is a hazard.

If the poorly drained Clamo, Hoven, Plankinton, and Tetonka soils and the very poorly drained Worthing soils are pastured, the choice of pasture plants is limited to water tolerant species, such as Garrison creeping foxtail and reed canarygrass.

Proper stocking rates, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition. If the pasture is overgrazed, the grasses lose vigor and die and are usually replaced by annual grasses and by weeds.

yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that insures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils.

land capability classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit (7). Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have slight limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The capability classification of each map unit is given in the section "Detailed soil map units."

rangeland

Gary D. Kruse, district conservationist, Soil Conservation Service, helped prepare this section.

About 42 percent of the acreage of Aurora County is rangeland. More than 75 percent of the farm income is derived from the sale of livestock or livestock products, principally cattle. Cow-calf-steer operations are dominant throughout the county. The average size of farms or ranches is about 720 acres.

The rangeland generally is in the central part of the county, but scattered tracts of rangeland are in the northwestern and southwestern parts. The soils used as rangeland generally are too steep, too thin, too saline, or too droughty for cultivated crops. Examples are Betts, Delmont, Dudley, Durrstein, Ethan, Jerauld, and Talmo soils.

On many farms the forage produced on rangeland is supplemented with crop stubble and tame pasture grasses. In winter the native forage commonly is supplemented with protein concentrate. On some ranches the market weight of calves and yearlings is increased by creep feeding.

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on rangeland are closely related to the kind of soil. Effective management is based on the relationship between the soils and vegetation and water.

Table 6 shows, for many soils in the survey area, the range site; the total annual production of vegetation in favorable, normal, and unfavorable years; the characteristic vegetation; and the average percentage of each species. Only those soils that are used as or are suited to rangeland are listed. Explanation of the column headings in table 6 follows.

A *range site* is a distinctive kind of rangeland that produces a characteristic natural plant community that differs from natural plant communities on other range sites in kind, amount, and proportion of range plants. The relationship between soils and vegetation was ascertained during this survey; thus, range sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important.

Total production is the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In a normal year, growing conditions are about average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Dry weight is the total annual yield per acre reduced to a common percent of air-dry moisture.

Characteristic vegetation—the grasses, forbs, and shrubs that make up most of the potential natural plant community on each soil—is listed by common name. Under *composition*, the expected percentage of the total annual production is given for each species making up the characteristic vegetation. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season.

Range management requires a knowledge of the kinds of soil and of the potential natural plant community. It also requires an evaluation of the present range condition. Range condition is determined by comparing the present plant community with the potential natural plant community on a particular range site. The more closely the existing community resembles the potential community, the better the range condition. Range condition is an ecological rating.

The objective in range management is to control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site. Such management generally results in the optimum production of vegetation, control of undesirable brush species, conservation of water, and control of erosion and soil blowing. Sometimes, however, a range condition somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

The native vegetation in many parts of the county has been greatly depleted by continued excessive use. Much of the acreage that was once mixed prairie is now covered with short grasses and weeds. The amount of forage produced may be less than half of that originally produced. The productivity of the range can be increased by applying management that is effective on specific kinds of soil and range sites.

An adequate plant cover and ground mulch help to control erosion and increase the moisture supply by reducing the runoff rate. If the range is overgrazed, the more desirable tall grasses lose vigor and are replaced by less productive short grasses. Proper grazing use and deferred grazing help to keep the range in good condition. Crossfencing and properly distributed watering facilities help to obtain a uniform distribution of grazing.

native woods and windbreaks and environmental plantings

Gary D. Kruse, district conservationist, Soil Conservation Service, helped prepare this section.

Native trees and shrubs grow on only about 500 acres in Aurora County. They generally grow in the areas on rangeland where soil and water relationships are favorable. Most grow near the margins of natural lakes, on flood plains, and on breaks to the deeper drainageways. Nearly all of these areas are used for wildlife habitat. The soils that support trees are not classified as woodland soils.

Scattered individual plants or clumps of American elm, American plum, box elder, bur oak, common chokecherry, common hackberry, false indigo, green ash, western snowberry, and wild rose are common on the

Betts soils in draws. Peachleaf willow, plains cottonwood, and sandbar willow are common on the margins of the natural lakes throughout the county. Russian-olive, an introduced species, is common on nearly all of the soils in the county.

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, keep snow from blowing off the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To insure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 7 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 7 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens.

Grazing is detrimental to windbreaks and environmental plantings because the livestock compact the soil and remove the lower branches of the trees and shrubs. The compaction retards growth. Removal of the lower branches reduces the effectiveness of the windbreak. Weeds and insects prevent maximum growth. Clean cultivation and applications of herbicide help to control weeds. Fallowing a year before planting helps to provide a reserve supply of moisture, which is needed before seedlings can be established. On Blendon and other soils that are susceptible to soil blowing, the site should be prepared in the spring. If the site is prepared in the fall, it is exposed during the winter.

Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a nursery.

wildlife habitat

John B. Farley, biologist, Soil Conservation Service, helped prepare this section.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 8, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges and management areas, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are barley, corn, millet, oats, sunflower, and wheat.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are alfalfa, intermediate wheatgrass, smooth bromegrass, tall wheatgrass, and yellow sweetclover.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are beggarweed, big and little bluestem, blue grama, goldenrod, switchgrass, and western wheatgrass.

Hardwood trees are planted trees and shrubs that produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are American elm, apple, boxelder, bur oak, green ash, hackberry, and plains cottonwood. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are American plum, common chokecherry, cotoneaster, honeysuckle, and Russian-olive.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are inland saltgrass, prairie cordgrass, reeds, rushes, smartweed, sedges, and wild millet.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are duck fields, marshes, ponds, and shallow dugouts.

The chief wildlife species in the county are whitetail deer, red fox, cottontail, and upland game birds, such as ring-necked pheasant, gray partridge, and sharp-tailed grouse. The habitat for the various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include cottontail, gray partridge, meadowlark, mourning dove, red fox, ring-necked pheasant, sparrow, and whitetail jackrabbit.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of these are waterfowl production areas. Some of the wildlife attracted to the wetlands are beaver, ducks, geese, herons, mink, muskrat, and shorebirds.

Habitat for rangeland wildlife consists of areas of shrubs and wild herbaceous plants. Wildlife attracted to rangeland include lark bunting, meadowlark, sharp-tailed grouse, whitetail deer, and whitetail jackrabbit.

engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

building site development

Table 9 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, and local roads and streets. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

sanitary facilities

Table 10 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 10 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to effectively filter the effluent. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 10 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 10 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

construction materials

Table 11 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 11, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

water management

Table 12 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and for embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of soil blowing or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of soil blowing, low available water capacity, restricted rooting depth, toxic substances, such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

soil properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

engineering index properties

Table 13 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and their morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains particles coarser than sand, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

physical and chemical properties

Table 14 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K in this survey area range from 0.10 to 0.43. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to soil blowing in cultivated areas. The groups indicate the susceptibility to soil blowing and the amount of soil lost. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control soil blowing are used.

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5

percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control soil blowing are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to soil blowing.

soil and water features

Table 15 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt and water in swamps and marshes are not considered flooding.

Table 15 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered is local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 15 are the depth to the seasonal high water table; the kind of water table—that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 15.

An apparent water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. An artesian water table is under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole. A perched water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is either soft or hard. If the rock is soft or fractured, excavations generally can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavations.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*8*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 16, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol.* An example is Mollisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Ustoll (*Ust*, meaning intermittent dryness, plus *oll*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haplustolls (*Hapl*, meaning minimal horizonation, plus *ustolls*, the suborder of the Mollisols that have an ustic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Haplustolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, mesic Typic Haplustolls.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

soil series and their morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*6*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*8*). Unless otherwise stated, matrix colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed soil map units."

Alwilda series

The Alwilda series consists of somewhat excessively drained soils on high stream terraces and on uplands. These soils are moderately deep over gravelly sand and sand. They formed in loamy and sandy sediments overlying gravelly sand and sand. Permeability is moderately rapid in the subsoil and rapid in the underlying material. Slopes range from 0 to 2 percent.

Alwilda soils are similar to Blendon soils and commonly are near Blendon, Delmont, and Enet soils. Their position on the landscape is similar to that of the nearby soils. Blendon soils are not underlain by gravelly sand. Delmont and Enet soils contain more clay in the subsoil than the Alwilda soils.

Typical pedon of Alwilda loam, 0 to 2 percent slopes, 700 feet south and 600 feet east of the northwest corner of sec. 16, T. 105 N., R. 63 W.

A1—0 to 6 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, very friable; slightly acid; clear smooth boundary.

A12—6 to 10 inches; very dark gray (10YR 3/1) fine sandy loam, black (10YR 2/1) moist; weak medium and coarse subangular blocky structure parting to weak fine granular; slightly hard, very friable; neutral; clear smooth boundary.

B21—10 to 14 inches; very dark gray (10YR 3/1) sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to weak fine and medium subangular blocky; slightly hard, very friable; neutral; clear smooth boundary.

B22—14 to 23 inches; dark grayish brown (10YR 4/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to weak fine and medium subangular blocky; slightly hard, very friable; neutral; clear smooth boundary.

B3ca—23 to 29 inches; light brownish gray (2.5Y 6/2) loamy sand, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, very friable; strong effervescence; mildly alkaline; abrupt smooth boundary.

IIC1ca—29 to 51 inches; light brownish gray (2.5Y 6/2) gravelly sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose; strong effervescence; moderately alkaline; diffuse wavy boundary.

IIC2—51 to 60 inches; multicolored sand; single grain; loose; slight effervescence; mildly alkaline.

The thickness of the solum and the depth to free carbonates range from 20 to 30 inches. The mollic epipedon is 15 to 20 inches thick. The soils have the colors of a mollic epipedon to a depth of more than 20 inches, but they do not have a mollic epipedon because the content of organic carbon is less than 0.6 percent.

The A horizon has value of 3 or 4 (2 or 3 moist) and chroma of 1 or 2. It ranges from medium acid to neutral. It typically is loam, but sandy loam and fine sandy loam are within the range.

The B2 horizon has value of 3 to 5 (2 or 3 moist) and chroma of 1 to 3. It is sandy loam or fine sandy loam. It is slightly acid or neutral. The B3 horizon has hue of 10YR or 2.5Y, value of 4 to 6 (3 or 4 moist), and chroma of 2 to 4. It is loamy sand or loamy fine sand. It is slightly acid to mildly alkaline.

The IIC horizon has hue of 10YR or 2.5Y, value of 5 to 7 (3 to 5 moist), and chroma of 1 to 3. It dominantly is gravelly sand, gravelly loamy sand, loamy fine sand, loamy sand, or sand, but in some pedons it has thin lenses of silt loam, loam, or clay loam. It is mildly alkaline or moderately alkaline. Coatings of carbonate are on the undersides of the pebbles.

Arlo series

The Arlo series consists of deep, very poorly drained soils formed in loamy sediments overlying gravelly loamy sand. Permeability is moderate in the solum and rapid in the underlying material. These soils are in slightly concave areas on uplands. Slopes range from 0 to 2 percent.

Arlo soils commonly are near Bon, Delmont, Dimo, Durrstein, and Enet soils. The moderately well drained Bon soils are on flood plains. The somewhat excessively drained Delmont soils and the well drained Enet soils are on the higher ridges and knolls. The somewhat poorly drained Dimo soils are in swales and drainageways in the uplands. Durrstein soils have sodium salts in the subsoil. They are on flood plains.

Typical pedon of Arlo loam, 1,980 feet east and 50 feet north of the southwest corner of sec. 27, T. 104 N., R. 66 W.

A1—0 to 7 inches; very dark gray (2.5Y 3/1) loam, black (2.5Y 2/1) moist; moderate fine and medium granular structure; slightly hard, friable; strong effervescence; moderately alkaline; clear smooth boundary.

ACca—7 to 15 inches; gray (2.5Y 6/1) and dark gray (2.5Y 4/1) clay loam, dark gray (5Y 4/1) and black (5Y 2/1) moist; few fine distinct strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common fine accumulations of carbonate; violent effervescence; moderately alkaline; gradual wavy boundary.

C1ca—15 to 24 inches; gray (2.5Y 6/1) clay loam, dark gray (5Y 4/1) moist; common medium faint black (5Y 2/1) and few fine distinct strong brown (7.5YR 5/6) mottles; weak medium and coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common fine accumulations of carbonate; violent effervescence; mildly alkaline; gradual wavy boundary.

C2ca—24 to 28 inches; light gray (2.5Y 7/2) loam, gray (5Y 5/1) moist; many fine distinct strong brown (7.5YR 5/6) and olive yellow (2.5Y 6/6) mottles; massive; hard, friable; about 10 percent coarse fragments; common fine and medium accumulations of carbonate; violent effervescence; moderately alkaline; clear wavy boundary.

IIC3—28 to 34 inches; light brownish gray (2.5Y 6/2) gravelly loamy sand, olive gray (5Y 5/2) moist; single grain; soft, very friable; strong effervescence; moderately alkaline; gradual wavy boundary.

IIC4—34 to 60 inches; grayish brown (2.5Y 5/3) gravelly loamy sand, olive gray (5Y 5/2) moist; many fine distinct strong brown (7.5YR 5/6), black (5Y 2/2), and olive yellow (2.5Y 6/6) mottles; single grain; soft, very friable; strong effervescence; moderately alkaline.

The thickness of the mollic epipedon ranges from 7 to 15 inches. The depth to gravelly material ranges from 20 to 34 inches. Reaction is mildly alkaline or moderately alkaline throughout the profile.

The A horizon has value of 3 to 5 (2 or 3 moist) and chroma of 1 or less. It dominantly is loam but in some pedons is clay loam. It is 6 to 11 inches thick. The AC horizon has value of 3 to 6 (2 or 4 moist) and chroma of 1 or less. It is loam or clay loam. The C horizon has hue of 2.5Y or 5Y, value of 6 to 8 (4 to 6 moist), and chroma of 1 or 2. It is clay loam, loam, sandy clay loam, or gravelly clay loam. In some pedons it has gypsum crystals. The IIC horizon has value of 5 to 7 (4 to 6 moist) and chroma of 1 to 4. It dominantly is gravelly loamy sand, gravelly sand, or loamy sand, but it is stratified with loam and clay loam in some pedons.

Beadle series

The Beadle series consists of deep, well drained soils formed in glacial till on uplands. Permeability is moderately slow. Slopes range from 0 to 6 percent.

Beadle soils commonly are near Dudley, Houdek, Hoven, Jerauld, and Plankinton soils. Dudley and Jerauld soils have a natric horizon. They are on short, concave side slopes. Houdek soils contain less clay in the subsoil than the Beadle soils. They are on the slightly higher ridges and knolls. Hoven and Plankinton soils are poorly drained and are in depressions.

Typical pedon of Beadle loam, in an area of Beadle-Dudley complex, 0 to 3 percent slopes, 1,475 feet north and 515 feet east of the southwest corner of sec. 20, T. 105 N., R. 64 W.

Ap—0 to 6 inches; very dark grayish brown (10YR 3/2) loam, black (10YR 2/1) moist; weak fine granular structure; soft, very friable; slightly acid; abrupt smooth boundary.

B21t—6 to 11 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium and coarse prismatic structure parting to moderate fine and medium subangular blocky; hard, firm, sticky and plastic; neutral; clear wavy boundary.

B22t—11 to 17 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to moderate fine and medium subangular and angular blocky; hard, firm, sticky and plastic; dark gray (10YR 4/1) coatings on vertical faces of peds; neutral; gradual wavy boundary.

B3ca—17 to 31 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; weak medium and coarse prismatic structure parting to weak medium subangular blocky; hard, friable, sticky and plastic; common fine and few medium accumulations of carbonate; strong effervescence; mildly alkaline; gradual wavy boundary.

C1ca—31 to 40 inches; light yellowish brown (2.5Y 6/4) clay loam, olive brown (2.5Y 4/4) moist; common fine faint light brownish gray (2.5Y 6/2) and few fine distinct yellowish brown (10YR 5/6) mottles; massive; hard, friable, sticky and slightly plastic; many fine and medium accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

C2—40 to 60 inches; pale yellow (2.5Y 7/4) clay loam, light olive brown (2.5Y 5/4) moist; common fine distinct light gray (2.5Y 6/1) and yellowish brown (10YR 5/6) mottles; massive; slightly hard, friable, slightly sticky and slightly plastic; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 16 to 33 inches. The depth to free carbonates ranges from 12 to 21 inches (fig. 9). The mollic epipedon is 10 to 20 inches thick.

The A horizon has value of 3 or 4 (2 or 3 moist) and chroma of 1 or 2. It is 6 to 9 inches thick. It is slightly acid or neutral. The B2t horizon has hue of 10YR or 2.5Y, value of 3 to 5 (3 or 4 moist), and chroma of 2 or 3. It is clay loam or clay. It is neutral or mildly alkaline. The C horizon is loam, clay loam, or silty clay loam. Its mottles are inherited from the parent material. Some pedons have gypsum crystals below a depth of 40 inches. Some have weathered shale chips.

Betts series

The Betts series consists of deep, well drained soils formed in glacial till on uplands. Permeability is moderate in the upper part of the soils and moderately slow in the underlying material. Slopes range from 9 to 40 percent.

Betts soils are similar to and commonly are near Ethan soils. Ethan soils have a mollic epipedon. They are on the less sloping parts of the landscape.

Typical pedon of Betts loam, in an area of Betts-Ethan loams, 15 to 40 percent slopes, 1,700 feet south and 130 feet west of the northeast corner of sec. 35, T. 105 N., R. 65 W.

A1—0 to 3 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak fine granular structure; slightly hard, friable; many fine and very fine roots; slight effervescence; mildly alkaline; abrupt smooth boundary.

B2ca—3 to 8 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to weak fine subangular blocky; hard, friable; common fine and medium roots; common fine and medium distinct black (10YR 2/1) worm casts; strong effervescence; mildly alkaline; clear wavy boundary.

C1ca—8 to 23 inches; light gray (2.5Y 7/2) clay loam, grayish brown (2.5Y 5/2) moist; many fine faint olive brown (2.5Y 4/4) and few fine prominent yellowish

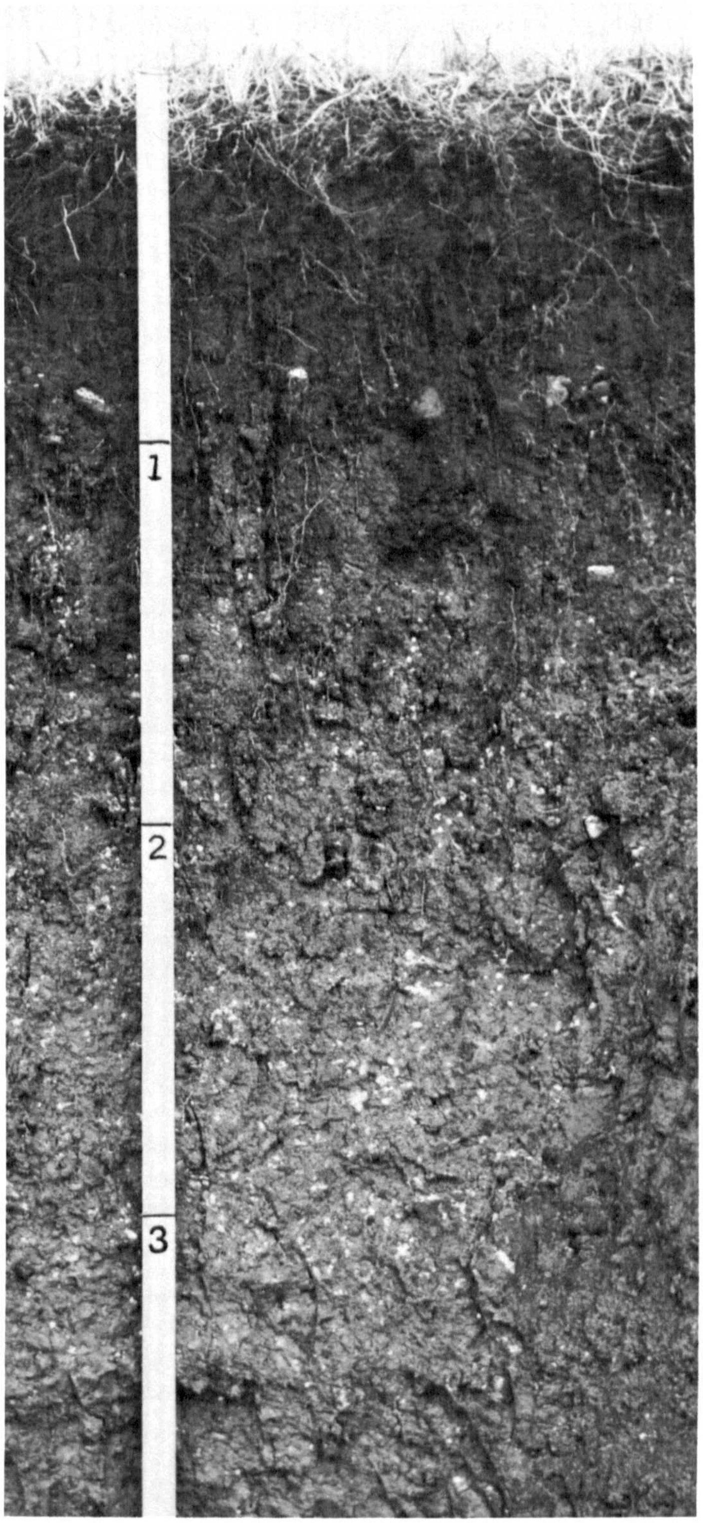

Figure 9.—Profile of Beadle loam, in an area of Beadle-Dudley complex, 0 to 3 percent slopes. Accumulations of carbonate are in the lower part of the subsoil and in the upper part of the underlying material. Depth is marked in feet.

red (5YR 5/6) and dark reddish brown (5YR 3/3) mottles; weak medium prismatic structure parting to weak medium subangular blocky; hard, friable; few fine and medium vertical roots; common fine accumulations of carbonate; strong effervescence; mildly alkaline; gradual wavy boundary.

C2—23 to 39 inches; light gray (2.5Y 7/2) clay loam, grayish brown (2.5Y 5/2) moist; few fine and medium prominent yellowish red (5YR 5/6) and dark reddish brown (5YR 3/3) and common fine distinct very dark brown (10YR 2/2) and gray (5Y 5/1) mottles; massive; hard, friable; few fine and medium vertical roots; few fine accumulations of carbonate; strong effervescence; mildly alkaline; gradual wavy boundary.

C3—39 to 60 inches; light gray (2.5Y 7/2) clay loam, light brownish gray (2.5Y 6/2) moist; common fine distinct black (10YR 2/1) and very dark brown (10YR 2/2) and few fine and medium prominent yellowish red (5YR 5/6) and dark reddish brown (5YR 3/3) mottles; massive; hard, friable; common nests and threads of gypsum crystals; few fine accumulations of carbonate; strong effervescence; mildly alkaline.

The thickness of the solum is less than 10 inches. The depth to free carbonates is 0 to 3 inches.

The A horizon has value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2. The B2 horizon has hue of 10YR or 2.5Y, value of 5 or 6 (4 or 5 moist), and chroma of 2 or 3. It is clay loam or loam. The C horizon has value of 5 to 7 (4 to 6 moist) and chroma of 2 to 4. It is clay loam or loam. Its mottles are inherited from the parent material. Gypsum crystals are in the lower part of some pedons.

Blendon series

The Blendon series consists of deep, well drained soils formed in loamy and sandy glacial outwash on uplands. Permeability is moderately rapid in the subsoil and rapid in the underlying material. Slopes range from 0 to 6 percent.

Blendon soils are similar to Alwilda soils and commonly are near Alwilda, Clarno, Delmont, and Enet soils. Alwilda, Delmont, and Enet soils are underlain by gravelly sand. Clarno soils contain more clay in the subsoil than the Blendon soils. All of the nearby soils are in positions on the landscape similar to those of the Blendon soils.

Typical pedon of Blendon fine sandy loam, 3 to 6 percent slopes, 545 feet west and 1,350 feet north of the southeast corner of sec. 17, T. 104 N., R. 63 W.

A1—0 to 11 inches; dark gray (10YR 4/1) fine sandy loam, black (10YR 2/1) moist; weak medium and coarse prismatic structure parting to weak fine granular; slightly hard, very friable; many fine and very fine roots; slightly acid; gradual wavy boundary.

B21—11 to 20 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium and coarse prismatic structure parting to weak medium subangular blocky; slightly hard, friable; many fine and very fine roots; slightly acid; gradual wavy boundary.

B22—20 to 33 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2 moist; few fine faint very dark gray (10YR 3/1) mottles; moderate medium and coarse prismatic structure parting to weak medium subangular blocky; slightly hard, friable; common fine and very fine roots; slightly acid; gradual wavy boundary.

B3—33 to 37 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; few fine faint very dark gray (10YR 3/1) mottles; weak coarse subangular blocky structure; slightly hard, friable; neutral; clear wavy boundary.

C1—37 to 48 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; many fine and medium distinct black (10YR 2/1) stains; few fine distinct yellowish brown (10YR 5/6) mottles; single grain; slightly hard, very friable; few fine nests of gypsum crystals; mildly alkaline; gradual wavy boundary.

C2—48 to 60 inches; light brownish gray (2.5Y 6/2) loamy fine sand, grayish brown (2.5Y 5/2) moist; many medium distinct yellowish brown (10YR 5/6) mottles; common medium and coarse faint very dark gray (10YR 3/1) mottles; single grain; soft, very friable; mildly alkaline.

The thickness of the solum ranges from 24 to 43 inches. The mollic epipedon ranges from 20 to 36 inches in thickness. The depth to free carbonates ranges from 40 to more than 60 inches.

The A horizon has value of 3 or 4 (2 moist) and chroma of 1 or 2. It typically is fine sandy loam but in some pedons is loam or sandy loam. It ranges from 10 to 15 inches in thickness. The B2 horizon has value of 3 or 4 (2 or 3 moist) and chroma of 1 or 2. It is fine sandy loam or sandy loam. It is slightly acid or neutral. The C horizon has value of 5 to 7 (3 to 5 moist) and chroma of 2 to 4. It is fine sandy loam, loamy fine sand, sandy loam, loamy sand, or sand. Glacial till is between depths of 40 and 60 inches in some pedons. The mottles are inherited from the parent material.

Bon series

The Bon series consists of deep, moderately well drained soils formed in loamy alluvium on terraces and flood plains along streams. Permeability is moderate. Slopes range from 0 to 2 percent.

Bon soils commonly are near Arlo, Clamo, Dimo, Durrstein, and Prosper soils. Arlo and Dimo soils formed in glacial outwash. Clamo and Durrstein soils are poorly drained. They are on the lower parts of the landscape. Prosper soils formed in glacial till. They are in swales in the adjacent uplands.

Typical pedon of Bon loam, 1,185 feet north and 175 feet east of the southwest corner of sec. 24, T. 104 N., R. 63 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium granular structure; slightly hard, very friable; mildly alkaline; clear wavy boundary.

A12—8 to 13 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to weak medium and coarse subangular blocky; hard, very friable; slight effervescence; mildly alkaline; clear wavy boundary.

A13—13 to 19 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak coarse prismatic structure parting to weak medium and coarse subangular blocky; slightly hard, very friable; strong effervescence; mildly alkaline; clear wavy boundary.

A14—19 to 28 inches; gray (10YR 5/1) loam, very dark gray (10YR 3/1) moist; weak coarse prismatic structure parting to weak medium and coarse subangular blocky; hard, friable; strong effervescence; moderately alkaline; gradual wavy boundary.

C1—28 to 40 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable; many fine accumulations of carbonate; strong effervescence; moderately alkaline; diffuse irregular boundary.

C2—40 to 52 inches; pale brown (10YR 6/3) loam, dark brown (10YR 4/3) moist; massive; hard, very friable; few fine accumulations of carbonate; strong effervescence; moderately alkaline; clear wavy boundary.

C3—52 to 60 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable; common very fine accumulations of carbonate; strong effervescence; moderately alkaline.

The mollic epipedon ranges from 20 to 40 inches in thickness. The depth to free carbonates generally ranges from 6 to 16 inches but some pedons are calcareous to the surface.

The A horizon has hue of 10YR or 2.5Y, value of 3 to 5 (2 to 4 moist), and chroma of 1 or 2. It typically is loam, but in places it is silt loam or very fine sandy loam. It ranges from neutral to moderately alkaline. It is 20 to 38 inches thick. Some pedons have an AC horizon or a B2 horizon. The C horizon has hue of 10YR to 5Y, value of 5 to 7 (4 or 5 moist), and chroma of 2 or 3. It is loam, silty clay loam, or fine sandy loam.

Clamo series

The Clamo series consists of deep, poorly drained soils formed in silty and clayey alluvium on low flood plains. Permeability is slow. Slopes range from 0 to 2 percent.

Clamo soils commonly are near Bon and Durrstein soils on flood plains. Bon soils are moderately well drained and are on the slightly higher flood plains. Durrstein soils have a natric horizon.

Typical pedon of Clamo silty clay loam, 1,710 feet east and 232 feet south of the northwest corner of sec. 6, T. 104 N., R. 63 W.

A11—0 to 3 inches; dark gray (2.5Y 4/1) silty clay loam, very dark gray (10YR 3/1) moist; moderate fine and medium granular structure; slightly hard, friable; many roots; medium acid; clear smooth boundary.

A12—3 to 8 inches; dark gray (2.5Y 4/1) silty clay, black (2.5Y 2/1) moist; weak coarse prismatic structure parting to weak medium and coarse subangular blocky; very hard, firm, sticky and plastic; many roots; neutral; abrupt wavy boundary.

B21g—8 to 14 inches; dark gray (5Y 4/1) silty clay, black (5Y 2/1) moist; weak coarse prismatic structure parting to weak fine and medium subangular blocky; very hard, firm, sticky and plastic; many roots; neutral; clear wavy boundary.

B22g—14 to 19 inches; dark gray (5Y 4/1) silty clay, black (5Y 2/1) moist; weak coarse and medium prismatic structure parting to weak fine and medium subangular blocky; very hard, firm, sticky and plastic; common fine roots; slight effervescence; mildly alkaline; clear wavy boundary.

B3gca—19 to 34 inches; dark gray (5Y 4/1) silty clay, very dark gray (5Y 3/1) moist; weak coarse prismatic structure parting to weak medium subangular blocky; very hard, firm, sticky and plastic; common fine roots; common medium accumulations of carbonate; strong effervescence; mildly alkaline; clear wavy boundary.

C1gca—34 to 46 inches; gray (5Y 5/1) silty clay, very dark gray (5Y 3/1) moist; massive; very hard, firm, sticky and plastic; few fine roots; many medium and coarse accumulations of carbonate; strong effervescence; mildly alkaline; diffuse wavy boundary.

C2gcacs—46 to 60 inches; gray (5Y 5/1) silty clay, dark gray (5Y 4/1) moist; few fine distinct olive yellow (2.5Y 6/6), light gray (2.5Y 6/1), and dark yellowish brown (10YR 4/4) mottles; massive; hard, firm, sticky and plastic; many fine nests of gypsum crystals; moderate medium accumulations of carbonate; strong effervescence; mildly alkaline.

The thickness of the solum ranges from about 20 to 40 inches. The thickness of the mollic epipedon ranges from 24 to more than 60 inches. The depth to free carbonates ranges from 14 to 25 inches. The control section averages as low as 35 percent clay in some pedons and as high as 50 percent clay in others.

The A horizon has hue of 10YR, 2.5Y, or 5Y, value of 3 or 4 (2 or 3 moist), and chroma of 1 or less. It ranges from medium acid to neutral and is 7 to 11 inches thick. It typically is silty clay loam, but in some cultivated areas the Ap horizon is silty clay. The B2 horizon has hue of 2.5Y or 5Y, value of 4 or 5 (2 or 3 moist), and chroma of 2 or less. It is silty clay loam, silty clay, or clay. It is neutral or mildly alkaline. The C horizon has hue of 2.5Y or 5Y, value of 4 to 7 (3 to 5 moist), and chroma of 1 or 2. It is mildly alkaline or moderately alkaline. It is silty clay, silty clay loam, or clay. Some pedons have thin layers of sand and gravel or buried horizons below a depth of 40 inches.

Clarno series

The Clarno series consists of deep, well drained soils formed in glacial till on uplands. Permeability is moderate in the subsoil and moderately slow in the underlying material. Slopes range from 0 to 9 percent.

Clarno soils are similar to Ethan and Houdek soils and commonly are near Blendon, Ethan, Houdek, and Prosper soils. Blendon soils contain less clay in the subsoil than the Clarno soils. They are in swales. Ethan soils have carbonates within a depth of 10 inches. They are on the slightly higher ridges and knolls. Houdek soils have an argillic horizon. Prosper soils are moderately well drained and are in swales.

Typical pedon of Clarno loam, in an area of Clarno-Prosper loams, 0 to 3 percent slopes, 1,285 feet west and 85 feet south of the northeast corner of sec. 33, T. 105 N., R. 63 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak fine granular structure; hard, friable; neutral; abrupt smooth boundary.

B2l—8 to 13 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium and coarse prismatic structure parting to weak medium and coarse subangular blocky; slightly hard, friable; neutral; clear wavy boundary.

B22—13 to 18 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak medium and coarse prismatic structure parting to weak medium and coarse subangular blocky; slightly hard, friable; neutral; abrupt wavy boundary.

B3ca—18 to 32 inches; pale yellow (2.5Y 7/3) loam, light olive brown (2.5Y 5/3) moist; weak coarse prismatic structure parting to weak coarse subangular blocky; slightly hard, friable; many fine and medium accumulations of carbonate; strong effervescence; mildly alkaline; gradual wavy boundary.

C1—32 to 42 inches; pale yellow (2.5Y 7/4) loam, olive brown (2.5Y 4/4) moist; massive; hard, friable, slightly sticky and slightly plastic; strong effervescence; moderately alkaline; diffuse wavy boundary.

C2cs—42 to 60 inches; pale yellow (2.5Y 7/4) loam, light olive brown (2.5Y 5/4) moist; many coarse prominent yellow (10YR 7/8), olive yellow (2.5Y 6/6), and gray (2.5Y 6/1) mottles; massive; hard, friable; common medium nests of gypsum crystals; strong effervescence; moderately alkaline.

The solum ranges from 20 to 38 inches in thickness. The mollic epipedon ranges from 8 to 20 inches in thickness. The depth to free carbonates ranges from 12 to 24 inches.

The A horizon has value of 3 or 4 (2 or 3 moist) and chroma of 1 or 2. It is slightly acid or neutral. The B2 horizon has hue of 10YR or 2.5Y and chroma of 2 or 3. It is loam or clay loam. It is neutral or mildly alkaline. The C horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 to 4. It is mildly alkaline or moderately alkaline. The mottles in the C2 horizon are inherited from the parent material. In some pedons this horizon does not have gypsum crystals.

DeGrey series

The DeGrey series consists of deep, moderately well drained soils formed in a silty mantle over glacial till. Permeability is slow. These soils are on uplands. Slopes range from 0 to 3 percent.

DeGrey soils are similar to Dudley soils and commonly are near Eakin, Highmore, Hoven, Jerauld, and Onita soils. Dudley soils formed in glacial till. Eakin, Highmore, and Onita soils do not have a natric horizon. Eakin and Highmore soils are on the slightly higher rises, and Onita soils are in swales and drainageways. Hoven soils are poorly drained. Jerauld soils have visible salts within a depth of 16 inches. Hoven and Jerauld soils are in shallow depressions.

Typical pedon of DeGrey silt loam, in an area of DeGrey-Onita silt loams, 0 to 2 percent slopes, 267 feet north and 1,310 feet east of the southwest corner of sec. 8, T. 104 N., R. 66 W.

A1—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam, black (10YR 2/1) moist; weak fine and medium granular structure; soft, very friable; slightly acid; clear smooth boundary.

A2—6 to 9 inches; gray (10YR 5/1) silt loam, very dark gray (10YR 3/1) moist; weak fine and medium subangular blocky structure; slightly hard, friable; slightly acid; abrupt smooth boundary.

B21t—9 to 12 inches; dark grayish brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) moist; moderate medium columnar structure parting to strong fine and medium blocky; hard, firm, sticky and plastic; light brownish gray (10YR 6/2) coatings on the tops of columns; neutral; clear smooth boundary.

B22t—12 to 18 inches; dark grayish brown (2.5Y 4/2) silty clay, very dark grayish brown (2.5Y 3/2) moist; moderate medium prismatic structure parting to strong fine and medium blocky; hard, firm, sticky and plastic; mildly alkaline; clear wavy boundary.

B3ca—18 to 27 inches; light olive brown (2.5Y 5/3) silty clay loam, olive brown (2.5Y 4/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; very dark gray (10YR 3/1) coatings on vertical faces of peds; few fine accumulations of carbonate; strong effervescence; moderately alkaline; clear wavy boundary.

C1casa—27 to 37 inches; light yellowish brown (2.5Y 6/4) silty clay loam, olive brown (2.5Y 4/3) moist; few fine distinct yellowish brown (10YR 5/6) mottles; weak medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and medium accumulations of carbonate; common fine nests of salts; strong effervescence; moderately alkaline; gradual wavy boundary.

C2ca—37 to 48 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; common fine distinct yellowish brown (10YR 5/6) and common fine faint gray (5Y 5/1) mottles; massive; slightly hard, firm, slightly sticky and slightly plastic; common fine and medium accumulations of carbonate; few fine nests of salts; strong effervescence; moderately alkaline; clear wavy boundary.

IIC3cs—48 to 60 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; common fine distinct strong brown (7.5YR 5/6), common medium faint gray (5Y 5/1), and many medium faint very dark gray (5Y 3/1) mottles; massive; hard, firm, sticky and plastic; few fine and medium accumulations of carbonate; common fine and medium nests of gypsum crystals; few fine weathered fragments of shale; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 15 to 34 inches. The depth to free carbonates and the thickness of the mollic epipedon range from 10 to 20 inches. The thickness of the silty material ranges from 20 to 40 inches or more.

The A1 horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It is slightly acid or neutral. The A2 horizon has value of 5 to 7 (3 or 4 moist) and chroma of 1 to 3. It is slightly acid or neutral. The B2t horizon has value of 4 or 5 (3 or 4 moist) and chroma of 1 or 2. It is silty clay or silty clay loam. It ranges from neutral to moderately alkaline. The C horizon is silty clay or silty clay loam. It is mildly alkaline or moderately alkaline. The IIC horizon is loam or clay loam. The mottles are inherited from the parent material.

Delmont series

The Delmont series consists of somewhat excessively drained soils on terraces and uplands. These soils are shallow over gravelly sand. They formed in loamy sediments overlying sand and gravel. Permeability is moderate in the subsoil and rapid in the underlying gravelly sand. Slopes range from 0 to 25 percent.

Delmont soils are similar to Enet soils and commonly are near Alwilda, Blendon, Dimo, Enet, and Talmo soils. Alwilda and Blendon soils contain more sand in the subsoil than the Delmont soils. They are in swales. Dimo and Enet soils are 20 to 40 inches deep over gravelly sand. They generally are below the Delmont soils on the landscape. Talmo soils are underlain by gravelly sand at a depth of 14 inches or less. They are on the steeper ridges.

Typical pedon of Delmont loam, in an area of Delmont-Enet loams, 0 to 2 percent slopes, 425 feet south and 170 feet west of the northeast corner of sec. 24, T. 104 N., R. 63 W.

Ap—0 to 5 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak fine and medium granular structure; slightly hard, very friable; neutral; clear wavy boundary.

B21—5 to 9 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, very friable; neutral; clear wavy boundary.

B22—9 to 16 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; weak medium and coarse prismatic structure parting to weak medium subangular blocky; slightly hard, very friable; neutral; gradual wavy boundary.

IIC1ca—16 to 31 inches; multicolored gravelly sand; single grain; loose; gravel coated with carbonate; strong effervescence; mildly alkaline; diffuse boundary.

IIC2—31 to 60 inches; multicolored gravelly sand; single grain; loose; slight effervescence; mildly alkaline.

The thickness of the solum and the thickness of the mollic epipedon range from 14 to 20 inches and correspond to the depth to gravelly sand. The depth to free carbonates ranges from 12 to 20 inches.

The A horizon has value of 3 or 4 (2 or 3 moist) and chroma of 1 or 2. It is 4 to 7 inches thick. It is neutral or mildly alkaline. The B2 horizon has value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2. It is neutral or mildly alkaline. The lower part of this horizon is calcareous in some pedons. Some pedons have a B3 or B3ca horizon.

Dimo series

The Dimo series consists of somewhat poorly drained soils in swales and drainageways on uplands. These soils are moderately deep over gravelly sand. They formed in loamy glacial outwash. Permeability is moderate in the subsoil and rapid in the underlying gravelly sand. Slopes range from 0 to 2 percent.

Dimo soils commonly are near Arlo, Bon, Delmont, and Enet soils. Arlo soils are very poorly drained. They are in slightly concave areas. Bon soils are not underlain by gravelly sand. They are on flood plains. Delmont soils are somewhat excessively drained and are on terraces. Enet soils are well drained and are on uplands.

Typical pedon of Dimo loam, 850 feet north and 170 feet east of the southwest corner of sec. 34, T. 101 N., R. 63 W.

A1—0 to 7 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, very friable; common fine and medium roots; slightly acid; clear wavy boundary.

B2—7 to 22 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; weak medium prismatic structure parting to weak fine and medium subangular blocky; hard, friable; common fine and medium roots; neutral; gradual wavy boundary.

B3ca—22 to 31 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium and coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine roots; about 10 percent coarse fragments; common fine accumulations of carbonate; strong effervescence; mildly alkaline; gradual wavy boundary.

IICca—31 to 60 inches; multicolored gravelly sand; common fine and medium dark yellowish brown (10YR 4/4) mottles; single grain; loose; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 20 to 40 inches. The thickness of the mollic epipedon and the depth to free carbonates range from 20 to 34 inches.

The A horizon has value of 3 or 4 (2 moist) and chroma of 1 or 2. It is medium acid or slightly acid. The B2 horizon has value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2. It is loam or clay loam. Some pedons do not have a B3 horizon. The content of coarse fragments in this horizon is 5 to 15 percent. In some pedons the IIC horizon has thin lenses of loam, clay loam, or silty clay loam.

Dudley series

The Dudley series consists of deep, moderately well drained soils formed in glacial till on uplands. Permeability is slow. Slopes range from 0 to 6 percent.

Dudley soils are similar to DeGrey soils and commonly are near Beadle, Houdek, Hoven, Jerauld, and Prosper soils. Beadle, Houdek, and Prosper soils do not have a natric horizon. Beadle and Houdek soils are on the slightly higher parts of the landscape. Prosper soils are in swales and drainageways. DeGrey soils formed in a silty mantle over glacial till. Hoven soils are poorly drained and are in depressions. Jerauld soils have visible salts within a depth of 16 inches. They are in positions on the landscape similar to those of the Dudley soils.

Typical pedon of Dudley silt loam, in an area of Dudley-Jerauld silt loams, 0 to 2 percent slopes, 795 feet south and 255 feet east of the northwest corner of sec. 24, T. 105 N., R. 64 W.

Ap—0 to 7 inches; dark gray (10YR 4/1) silt loam, very dark gray (10YR 3/1) moist; weak fine and medium granular structure; slightly hard, friable; neutral; abrupt smooth boundary.

A2—7 to 9 inches; gray (10YR 5/1) silt loam, dark gray (10YR 4/1) moist; weak fine and medium subangular blocky structure; slightly hard, friable; slightly acid; abrupt smooth boundary.

B21t—9 to 13 inches; very dark grayish brown (10YR 3/2) clay loam, very dark brown (10YR 2/2) moist; strong medium columnar structure parting to strong medium blocky; very hard, very firm, sticky and plastic; thin nearly continuous gray (10YR 5/1) coatings on the tops of columnar peds; shiny faces on peds; neutral; clear wavy boundary.

B22t—13 to 21 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to strong medium blocky; very hard, very firm, sticky and plastic; shiny faces on peds; mildly alkaline; clear wavy boundary.

B3cacs—21 to 30 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate coarse prismatic structure parting to moderate medium and coarse subangular blocky; hard, friable, sticky and plastic; shiny patchy faces on vertical peds; few dark concretions (iron and manganese oxide); many fine nests of gypsum crystals; many fine accumulations of carbonate; strong effervescence; mildly alkaline; gradual wavy boundary.

Ccacs—30 to 60 inches; light brownish gray (2.5Y 6/2) and light yellowish brown (2.5Y 6/4) clay loam, dark grayish brown (2.5Y 4/2) and olive brown (2.5Y 4/4) moist; massive; hard, friable, slightly sticky and plastic; many dark concretions (iron and manganese oxide); common fine nests of gypsum crystals; common fine accumulations of carbonate; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 20 to 40 inches. The thickness of the mollic epipedon ranges from 20 to 30 inches. The depth to free carbonates ranges from 19 to 25 inches and the depth to visible gypsum crystals from 16 to 24 inches.

The Ap or A1 horizon has value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2. It is loam or silt loam. It ranges from medium acid to neutral and is 5 to 8 inches thick. The A2 horizon has value of 5 to 7 (3 to 5 moist) and chroma of 1 or 2. It is silt loam or loam. It ranges from medium acid to neutral. In some pedons it is mixed with the Ap horizon. The B2t horizon has hue of 10YR or 2.5Y, value of 3 to 5 (2 or 3 moist), and chroma of 1 or 2. It is clay loam or clay. It ranges from neutral to moderately alkaline. The C horizon has hue of 2.5Y or 5Y, value of 5 to 7 (4 or 5 moist), and chroma of 2 to 4. It is moderately alkaline or strongly alkaline.

Durrstein series

The Durrstein series consists of deep, poorly drained soils formed in clayey and loamy alluvium on flood plains. Permeability is slow or very slow. Slopes are less than 1 percent.

Durrstein soils commonly are near Bon and Clamo soils on flood plains. These nearby soils do not have a high content of salts.

Typical pedon of Durrstein silt loam, 150 feet west and 1,567 feet south of the northeast corner of sec. 7, T. 105 N., R. 63 W.

A2—0 to 2 inches; gray (10YR 5/1) silt loam, very dark gray (10YR 3/1) moist; weak thin and medium platy structure parting to weak fine granular; soft, very friable; common fine and medium roots; slightly acid; abrupt smooth boundary.

B21t—2 to 8 inches; dark gray (10YR 4/1) clay loam, black (10YR 2/1) moist; moderate medium columnar structure parting to moderate fine and medium subangular blocky; very hard, firm, sticky and plastic; common fine and medium roots; neutral; clear wavy boundary.

B22t—8 to 13 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; very hard, firm, sticky and plastic; common fine and medium roots; mildly alkaline; clear wavy boundary.

B3sa—13 to 18 inches; gray (2.5Y 5/1) silty clay, very dark gray (2.5Y 3/1) moist; moderate coarse prismatic structure parting to moderate coarse subangular blocky; very hard, firm, sticky and plastic; common fine and medium roots; many fine and medium striations and nests of salts; few fine nests of gypsum crystals; moderately alkaline; gradual wavy boundary.

C1sa—18 to 27 inches; grayish brown (2.5Y 5/2) silty clay, very dark grayish brown (2.5Y 3/2) moist; weak medium and coarse subangular blocky structure; hard, firm, sticky and plastic; few medium roots; many fine and medium striations and nests of salts; few fine and medium nests of gypsum crystals; few fine and medium accumulations of carbonate; slight effervescence; moderately alkaline; gradual wavy boundary.

C2ca—27 to 41 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; common fine distinct black (2.5Y 2/2) mottles; massive; hard, friable, sticky and plastic; common fine and medium accumulations of carbonate; strong effervescence; strongly alkaline; gradual wavy boundary.

Abca—41 to 49 inches; gray (5Y 5/1) silty clay, very dark gray (5Y 3/1) moist; massive; hard, friable, sticky and plastic; common medium and coarse accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

C3ca—49 to 60 inches; light olive gray (5Y 6/2) silty clay, olive gray (5Y 5/2) moist; common fine distinct black (2.5Y 2/2) mottles; massive; very hard, firm, sticky and plastic; common medium and coarse accumulations of carbonate; strong effervescence; strongly alkaline.

The thickness of the solum ranges from 10 to 30 inches. The depth to accumulations of salts ranges from 5 to 15 inches.

The A horizon has value of 5 or 6 (3 or 4 moist) and chroma of 1 or 2. It is 1 to 4 inches thick. The B2t horizon has hue of 10YR or 2.5Y and value of 4 or 5 (2 or 3 moist). It is silty clay, clay, or clay loam. The C horizon has hue of 2.5Y or 5Y, value of 5 to 7 (3 to 5 moist), and chroma of 1 or 2. It is moderately alkaline or strongly alkaline. Some pedons do not have a buried horizon. Some have lenses of sand and gravel.

Eakin series

The Eakin series consists of deep, well drained soils that formed in a silty mantle overlying glacial till. Permeability is moderate in the subsoil and moderately slow in the underlying material. These soils are on uplands. Slopes range from 0 to 6 percent.

Eakin soils are similar to Highmore soils and commonly are near DeGrey, Ethan, Highmore, and Onita soils. DeGrey soils have a natric horizon. They are on short, concave side slopes. Ethan soils contain more sand and less silt in the subsoil than the Eakin soils. They are on ridges and knolls above the Eakin soils. Highmore soils are underlain by glacial till at a depth of more than 40 inches. Onita soils are moderately well drained and are in swales and drainageways.

Typical pedon of Eakin silt loam, in an area of Eakin-Ethan complex, 2 to 6 percent slopes, 150 feet south and 660 feet east of the northwest corner of sec. 11, T. 105 N., R. 66 W.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium subangular blocky structure; hard, friable; common fine roots; slightly acid; abrupt smooth boundary.

B21t—5 to 10 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; hard, firm, slightly sticky and slightly plastic; thin shiny films on faces of peds; common fine roots; neutral; clear smooth boundary.

B22t—10 to 14 inches; light olive brown (2.5Y 5/3) silty clay loam, olive brown (2.5Y 3/3) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; hard, firm, slightly sticky and slightly plastic; thin shiny films on faces of peds; neutral; clear smooth boundary.

B31ca—14 to 20 inches; light yellowish brown (2.5Y 6/4) silt loam, olive brown (2.5Y 4/4) moist; few fine faint strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable; common fine and medium accumulations of carbonate; strong effervescence; mildly alkaline; clear smooth boundary.

B32ca—20 to 26 inches; light brownish gray (2.5Y 6/2) silt loam, dark grayish brown (2.5Y 4/2) moist; common fine and medium distinct strong brown (7.5YR 5/6) and gray (5Y 5/1) mottles; weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, friable; common fine and medium accumulations of carbonate; strong effervescence; moderately alkaline; clear wavy boundary.

IIC1ca—26 to 34 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; many fine and medium distinct strong brown (7.5YR 5/6) and dark gray (5Y 4/1) mottles; weak medium and coarse subangular blocky structure; slightly hard, firm, sticky and plastic; common fine and medium accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

IIC2—34 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; many fine and medium distinct strong brown (7.5YR 5/6) and dark gray (5Y 4/1) mottles; massive; hard, firm, sticky and plastic; few fine dark concretions (iron and manganese oxide); few fine accumulations of carbonate; few fine and medium nests of gypsum crystals; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 20 to 30 inches. The depth to glacial till ranges from 20 to 40 inches. The mollic epipedon ranges from 7 to 18 inches in thickness. The depth to free carbonates ranges from 10 to 18 inches. The noncalcareous part of the pedon ranges from slightly acid to mildly alkaline, and the calcareous part is mildly alkaline or moderately alkaline.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It is 4 to 8 inches thick. The B2t horizon has value of 4 or 5 (3 or 4 moist) and chroma of 2 or 3. It averages as low as 28 percent clay in some pedons and as high as 35 percent clay in others. Its content of sand coarser than very fine sand is less than 15 percent. The IIC horizon has value of 5 to 7 (4 or 5 moist) and chroma of 2 to 4. It is loam, clay loam, or clay. The mottles are inherited from the parent material.

Enet series

The Enet series consists of well drained soils on terraces and uplands. These soils are moderately deep over gravelly sand and stratified sand and gravel (fig. 10). They formed in glacial outwash. Permeability is moderate in the subsoil and rapid in the underlying sand and gravel. Slopes range from 0 to 6 percent.

Enet soils are similar and Delmont soils and commonly are near Alwilda, Arlo, Blendon, Delmont, and Dimo soils. Alwilda and Blendon soils contain more sand in the subsoil than the Enet soils. They are on uplands. The very poorly drained Arlo and somewhat poorly drained Dimo soils are in swales and depressions. Delmont soils are shallower to gravelly sand than the Enet soils. They are in positions on the landscape similar to those of the Enet soils.

Typical pedon of Enet loam, 0 to 2 percent slopes, 2,530 feet west and 145 feet south of the northeast corner of sec. 13, T. 104 N., R. 63 W.

Ap—0 to 7 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak medium and coarse subangular blocky structure; slightly hard, very friable; neutral; abrupt smooth boundary.

B21—7 to 11 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak coarse prismatic structure parting to weak fine and medium subangular blocky; slightly hard, very friable; neutral; clear wavy boundary.

B22—11 to 21 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak medium prismatic structure parting to moderate medium and coarse subangular blocky; hard, friable; neutral; clear wavy boundary.

B3—21 to 24 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; weak coarse prismatic structure parting to weak medium and coarse subangular blocky; hard, friable; few fine accumulations of carbonate; slight effervescence; mildly alkaline; clear wavy boundary.

IIC1ca—24 to 28 inches; light brownish gray (10YR 6/2) gravelly sand, dark grayish brown (10YR 4/2) moist; single grain; loose; gravel coated with carbonate; strong effervescence; mildly alkaline; clear wavy boundary.

IIC2—28 to 60 inches; multicolored stratified sand and gravel; single grain; loose; many fine and medium fragments of shale in the lower part; strong effervescence; mildly alkaline.

The thickness of the solum and the depth to gravelly sand range from 20 to 40 inches. The thickness of the mollic epipedon and the depth to free carbonates range from 20 to 36 inches.

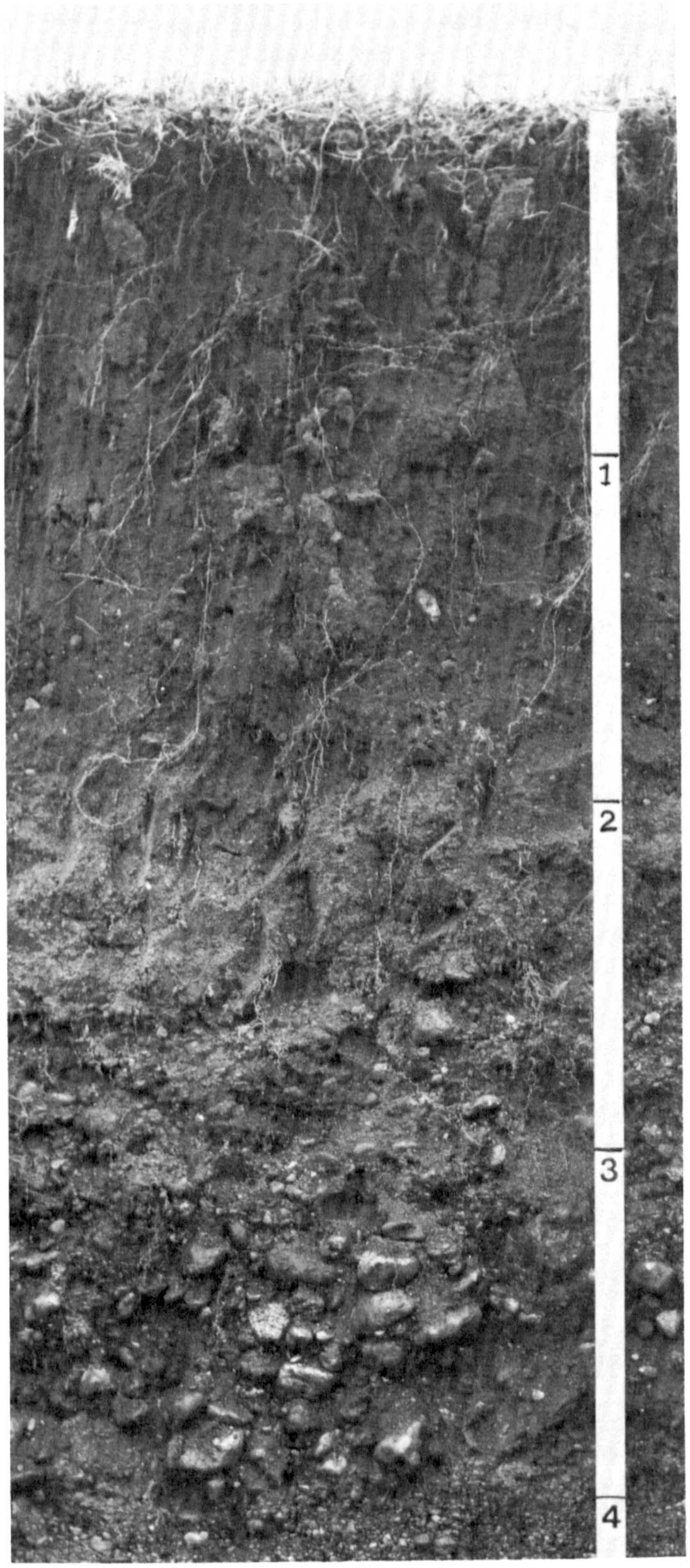

Figure 10.—Profile of Enet loam, 0 to 2 percent slopes. Gravelly sand is at a depth of about 26 inches. Depth is marked in feet.

The A horizon has value of 3 or 4 (2 or 3 moist) and chroma of 1 or 2. It typically is loam but in some pedons is silt loam. It is slightly acid or neutral. The B2 horizon has value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2. It is loam or clay loam. Some pedons have a B3 horizon. The IIC horizon has value of 5 to 7 (4 to 6 moist) and chroma of 2 to 4. It is gravelly sand, gravelly loamy sand, or stratified sand and gravel.

Ethan series

The Ethan series consists of deep, well drained soils formed in glacial till on uplands. Permeability is moderate in the subsoil and moderately slow in the underlying material. Slopes range from 2 to 25 percent.

Ethan soils are similar to Betts and Clarno soils and commonly are near Betts, Clarno, Eakin, and Houdek soils. Betts soils do not have a mollic epipedon. They are on the steeper parts of the landscape. Clarno, Eakin, and Houdek soils are leached of carbonates to a greater depth than the Ethan soils. They are on the less sloping parts of the landscape.

Typical pedon of Ethan loam, in an area of Houdek-Ethan loams, 2 to 6 percent slopes, 270 feet west and 200 feet north of the southeast corner of sec. 28, T. 103 N., R. 66 W.

A1—0 to 5 inches; dark grayish brown (10YR 4/2) loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, friable; common fine and very fine roots; neutral; clear wavy boundary.

B2—5 to 8 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak medium prismatic structure parting to weak fine and medium subangular blocky; slightly hard, friable; common fine roots; mildly alkaline; clear wavy boundary.

B3ca—8 to 22 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; hard, friable; few fine and medium roots; common fine and medium accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

C1ca—22 to 46 inches; light yellowish brown (2.5Y 6/4) clay loam, olive brown (2.5Y 4/4) moist; few fine distinct yellowish brown (10YR 5/6) mottles; weak medium and coarse prismatic structure parting to weak coarse subangular blocky; hard, friable, slightly sticky and slightly plastic; few fine and medium roots; common fine and medium accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

C2—46 to 60 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; few fine distinct yellowish brown (10YR 5/6) mottles; massive; hard, friable, slightly sticky and slightly plastic; few fine accumulations of carbonate; moderately alkaline.

The thickness of the solum ranges from 15 to 28 inches. The depth to free carbonates ranges from 0 to 9 inches. The thickness of the mollic epipedon ranges from 7 to 10 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It typically is loam but in some pedons is clay loam. The B2 horizon has value of 4 or 5 (2 or 3 moist) and chroma of 2 or 3. It is loam or clay loam. The B3ca horizon has value of 5 to 7 (4 to 6 moist) and chroma of 2 or 3. The C horizon has value of 5 to 8 (4 to 6 moist) and chroma of 2 to 4. It is clay loam, loam, or stratified silt loam, clay loam, and fine sandy loam. Its mottles are inherited from the parent material. Gypsum crystals are in some pedons.

Highmore series

The Highmore series consists of deep, well drained soils formed in silty glacial drift on uplands. Permeability is moderate in the upper part of these soils and moderately slow in the lower part of the underlying material. Slopes range from 0 to 2 percent.

Highmore soils are similar to Eakin soils and commonly are near DeGrey, Eakin, and Onita soils. DeGrey soils have a natric horizon. They are on short, concave side slopes and in plane areas. Eakin soils are underlain by glacial till within a depth of 40 inches. Onita soils contain more clay in the subsoil than the Highmore soils. They are in swales and drainageways.

Typical pedon of Highmore silt loam, in an area of Highmore-Onita silt loams, 0 to 2 percent slopes, 98 feet east and 2,340 feet south of the northwest corner of sec. 8, T. 104 N., R. 66 W.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; weak medium subangular blocky structure parting to weak fine granular; slightly hard, friable; common fine roots; slightly acid; abrupt smooth boundary.

A12—5 to 8 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; weak fine and medium subangular blocky structure; slightly hard, friable; common fine roots; slightly acid; clear smooth boundary.

B21t—8 to 13 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; thin shiny films on faces of peds; neutral; clear smooth boundary.

B22t—13 to 19 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 3/3) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; thin shiny films on faces of peds; neutral; clear wavy boundary.

B3ca—19 to 26 inches; light brownish gray (2.5Y 6/3) silt loam, grayish brown (2.5Y 5/3) moist; few fine distinct strong brown (7.5YR 5/6) and gray (5Y 5/1) mottles; weak coarse prismatic structure parting to weak medium subangular blocky; hard, friable; common fine and medium accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

C1ca—26 to 39 inches; light brownish gray (2.5Y 6/3) silt loam, grayish brown (2.5Y 5/3) moist; common fine and medium distinct strong brown (7.5YR 5/6) and gray (5Y 5/1) mottles; weak medium and coarse subangular blocky structure; slightly hard, friable; common fine and medium accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

C2ca—39 to 50 inches; light brownish gray (2.5Y 6/3) silt loam, grayish brown (2.5Y 5/3) moist; common fine and medium distinct dark reddish brown (5YR 2/2), strong brown (7.5YR 5/6), and gray (5Y 5/1) mottles; massive; slightly hard, friable; few fine dark concretions (iron and manganese oxide); few fine accumulations of carbonate; strong effervescence; moderately alkaline; clear wavy boundary.

IIC3—50 to 60 inches; light brownish gray (2.5Y 6/3) clay loam, grayish brown (2.5Y 5/3) moist; common fine and medium distinct dark reddish brown (5YR 2/2), strong brown (7.5YR 5/6), and gray (5Y 5/1) mottles; massive; slightly hard, friable, sticky and plastic; few fine dark concretions (iron and manganese oxide); common weathered shale fragments; few fine accumulations of carbonate; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 17 to 36 inches. The depth to free carbonates ranges from 12 to 26 inches. The thickness of the mollic epipedon ranges from 9 to 20 inches. The depth to glacial till ranges from 40 to 60 inches or more.

The A horizon has value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2. It is slightly acid or neutral. The B2t horizon has hue of 10YR or 2.5Y, value of 4 or 5 (2 to 4 moist), and chroma of 2 or 3. It is neutral or mildly alkaline. The C horizon has value of 5 to 7 (4 or 5 moist) and chroma of 2 to 4. It is silt loam, silty clay loam, or very fine sandy loam. It is mildly alkaline or moderately alkaline. The IIC horizon is loam or clay loam. The mottles in and below the B3 horizon are inherited from the parent material.

Houdek series

The Houdek series consists of deep, well drained soils formed in loamy glacial till on uplands. Permeability is moderate in the subsoil and moderately slow in the underlying material. Slopes range from 0 to 9 percent.

Houdek soils are similar to Clarno soils and commonly are near Dudley, Ethan, Hoven, Plankinton, and Prosper soils. Clarno and Ethan soils do not have an argillic horizon. Dudley soils contain more clay in the subsoil than the Houdek soils. They are on the slightly lower parts of the landscape. Ethan soils are on ridges and knolls. Hoven and Plankinton soils are poorly drained and are in depressions. Prosper soils are moderately well drained and are in swales and drainageways.

Typical pedon of Houdek loam, in an area of Houdek-Prosper loams, 0 to 3 percent slopes, 2,255 feet south and 90 feet east of the northwest corner of sec. 23, T. 102 N., R. 63 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) loam, black (10YR 2/1) moist; weak medium and fine subangular blocky structure; slightly hard, friable; slightly acid; abrupt smooth boundary.

B21t—7 to 13 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak medium and coarse prismatic structure parting to moderate fine and medium subangular blocky; hard, friable, slightly sticky and slightly plastic; shiny coatings on faces of peds; neutral; clear wavy boundary.

B22t—13 to 19 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; shiny coatings on faces of peds; neutral; abrupt wavy boundary.

B31ca—19 to 25 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; weak coarse prismatic structure parting to moderate coarse subangular blocky; hard, friable, slightly sticky and slightly plastic; shiny coatings on vertical faces of peds; few fine and medium accumulations of carbonate; strong effervescence; mildly alkaline; gradual wavy boundary.

B32ca—25 to 31 inches; light brownish gray (2.5Y 6/2) clay loam, light olive brown (2.5Y 5/3) moist; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many medium accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

C1ca—31 to 51 inches; pale yellow (5Y 7/3) clay loam, olive (5Y 5/3) moist; few fine distinct olive yellow (2.5Y 6/6) and light gray (2.5Y 6/1) mottles; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine dark concretions (iron and manganese oxide); common fine and medium accumulations of carbonate; strong effervescence; moderately alkaline; clear wavy boundary.

C2—51 to 60 inches; pale yellow (5Y 7/3) clay loam, olive (5Y 5/3) moist; many fine and medium distinct olive yellow (2.5Y 6/6) and light gray (2.5Y 6/1) mottles; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine dark concretions (iron and manganese oxide); strong effervescence; moderately alkaline.

The thickness of the solum ranges from 22 to 35 inches. The depth to free carbonates ranges from 14 to 24 inches. The thickness of the mollic epipedon ranges from 10 to 20 inches.

The Ap horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It typically is loam but in some pedons is silt loam. It is slightly acid or neutral. The B2t horizon has value of 4 to 6 (3 to 5 moist) and chroma of 2 or 3. It is neutral or mildly alkaline. The C horizon has hue of 5Y or 2.5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 to 4. It is mildly alkaline or moderately alkaline. The mottles and accumulations of carbonate range from few to many. The mottles are inherited from the parent material. Gypsum crystals are in some pedons.

Hoven series

The Hoven series consists of deep, poorly drained soils formed in local alluvium in depressions on uplands. Permeability is very slow. Slopes range from 0 to 2 percent.

Hoven soils are similar to Plankinton soils and commonly are near DeGrey, Dudley, Houdek, Jerauld soils on uplands and Plankinton soils in depressions in the uplands. DeGrey and Dudley soils are moderately well drained. Houdek and Plankinton soils do not have a natric horizon. Also, Houdek soils are well drained. Jerauld soils are somewhat poorly drained.

Typical pedon of Hoven silt loam, in an area of Hoven-Plankinton silt loams, 2,215 feet east and 1,450 feet south of the northwest corner of sec. 36, T. 103 N., R. 64 W.

A2—0 to 4 inches; light gray (10YR 6/1) silt loam, very dark gray (10YR 3/1) moist; common fine distinct olive yellow (2.5Y 6/6) and dark brown (7.5YR 4/4) mottles; weak thin platy structure; soft, very friable; many roots; medium acid; abrupt wavy boundary.

B21t—4 to 10 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; moderate medium and coarse columnar structure parting to strong fine blocky; very hard, very firm, sticky and plastic; light gray (10YR 6/1) coatings on tops of columnar peds; common fine roots; shiny coatings on faces of peds; slightly acid; clear wavy boundary.

B22t—10 to 25 inches; dark gray (2.5Y 4/1) silty clay, very dark gray (2.5Y 3/1) moist; moderate coarse prismatic structure parting to strong medium and coarse blocky; extremely hard, very firm, sticky and plastic; few fine roots; shiny coatings on faces of peds; mildly alkaline; gradual wavy boundary.

B3cs—25 to 40 inches; dark gray (2.5Y 4/1) silty clay, very dark gray (2.5Y 3/1) moist; moderate coarse prismatic structure parting to moderate medium and coarse subangular blocky; very hard, very firm, sticky and plastic; patchy shiny coatings on the faces of most peds; many fine nests of gypsum crystals; slight effervescence; mildly alkaline; diffuse wavy boundary.

C1cacs—40 to 54 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; many medium distinct light gray (2.5Y 6/1) and olive yellow (2.5Y 6/6) mottles; weak coarse subangular blocky structure; hard, friable, slightly sticky and plastic; many fine nests of gypsum crystals; many fine and medium accumulations of carbonate; violent effervescence; moderately alkaline; diffuse wavy boundary.

C2cacs—54 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; many medium distinct light gray (2.5Y 6/1) and olive yellow (2.5Y 6/6) mottles; massive; hard, friable, slightly sticky and plastic; common fine nests of gypsum crystals; many medium accumulations of carbonate; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 15 to 42 inches. Some pedons have an A1 horizon, which is less than 2 inches thick. The A2 horizon has value of 5 to 7 (2 to 4 moist) and chroma of 1 or 2. It typically is silt loam but in some pedons is silty clay loam. It ranges from medium acid to neutral and from 1 inch to 6 inches in thickness. The B2t horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It is silty clay, clay, clay loam, or silty clay loam. It ranges from slightly acid to mildly alkaline.

The C horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 7 (3 to 5 moist), and chroma of 1 to 3. It is clay loam, clay, silty clay, or silty clay loam. It ranges from mildly alkaline to strongly alkaline. Layers of coarser textured material and buried horizons are below a depth of 40 inches in some pedons.

Jerauld series

The Jerauld series consists of deep, somewhat poorly drained soils formed in glacial till on uplands. Permeability is slow or very slow. Slopes range from 0 to 3 percent.

Jerauld soils commonly are near Beadle, DeGrey, Dudley, Hoven, and Onita soils. Beadle soils do not have a natric horizon. They are on the slightly higher parts of the landscape. DeGrey and Dudley soils also are on the slightly higher parts of the landscape. They are deeper to salts than the Jerauld soils. Hoven soils are poorly drained and are in depressions. Onita soils do not have a natric horizon. They are moderately well drained and are in swales.

Typical pedon of Jerauld silt loam, in an area of Dudley-Jerauld silt loams, 0 to 2 percent slopes, 1,160 feet south and 340 feet west of the northeast corner of sec. 18, T. 105 N., R. 65 W.

A2—0 to 3 inches; gray (10YR 5/1) silt loam, very dark gray (10YR 3/1) moist; weak thin platy structure parting to weak fine granular; soft, very friable;

common fine roots; medium acid; abrupt smooth boundary.

B21t—3 to 8 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; moderate medium columnar structure parting to moderate fine and medium subangular blocky; very hard, firm, sticky and plastic; thin nearly continuous gray (10YR 6/1) coatings on the tops and sides of columns; common fine roots; mildly alkaline; clear wavy boundary.

B22tcacs—8 to 13 inches; dark gray (10YR 4/1) clay, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to moderate medium and fine subangular blocky; hard, firm, slightly sticky and plastic; common fine roots; few fine accumulations of carbonate; common fine nests and few fine threads of gypsum crystals; few fine accumulations of iron and manganese oxide; strong effervescence; moderately alkaline; gradual wavy boundary.

B3Cacs—13 to 19 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate medium and fine subangular blocky; hard, firm, slightly sticky and plastic; common fine roots; few fine accumualtions of carbonate; common fine nests and few fine threads of gypsum crystals; few fine accumulations of iron and manganese oxide; strong effervescence; moderately alkaline; gradual wavy boundary.

C1cacs—19 to 32 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure; hard, firm, slightly sticky and plastic; few fine roots; common fine accumulations of carbonate; common fine nests and threads of gypsum crystals; few fine accumulations of iron and manganese oxide; strong effervescence; strongly alkaline; gradual wavy boundary.

C2cs—32 to 45 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, slightly sticky and plastic; few fine accumulations of carbonate; common fine nests and threads of gypsum crystals; common fine accumulations of iron and manganese oxide; strong effervescence; strongly alkaline; gradual wavy boundary.

C3—45 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, slightly sticky and plastic; few fine calcium carbonate concretions; many fine and medium accumulations of iron and manganese oxide; strong effervescence; strongly alkaline.

The thickness of the solum ranges from 10 to 20 inches. The depth to salts and free carbonates ranges from 6 to 16 inches.

Some pedons have a thin A1 horizon. The A2 horizon has hue of 10YR or 2.5Y, value of 5 to 7 (3 to 5 moist), and chroma of 1 or 2. It typically is silt loam but in some pedons is loam or silty clay loam. It is medium acid or slightly acid. The B2t horizon has hue of 10YR or 2.5Y, value of 4 or 5 (2 or 3 moist), and chroma of 1 or 2. It is clay or silty clay. It is neutral or mildly alkaline. The C horizon has value of 5 to 7 (4 to 6 moist) and chroma of 1 to 4. It is clay, clay loam, silty clay loam, or silty clay. It is moderately alkaline or strongly alkaline. Stratified coarse textured material is below a depth of 40 inches in some pedons.

Lane series

The Lane series consists of deep, moderately well drained soils formed in clayey and silty alluvium on terraces and alluvial fans. Permeability is slow. Slopes range from 0 to 2 percent.

Lane soils are similar to Onita soils and commonly are near Houdek, Onita, Plankinton, and Prosper soils. Houdek and Prosper soils contain less clay in the subsoil than the Lane soils. Houdek soils are on the slightly higher parts of the landscape, and Prosper soils are in swales. Onita and Prosper soils do not have carbonates within a depth of 20 inches. The poorly drained Plankinton soils are in depressions.

Typical pedon of Lane silty clay loam, 130 feet north and 200 feet west of the southeast corner of sec. 19, T. 101 N., R. 64 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak medium and coarse subangular blocky structure parting to weak fine granular; slightly hard, friable, slightly sticky and slightly plastic; slightly acid; abrupt smooth boundary.

B21t—8 to 13 inches; very dark grayish brown (10YR 3/2) silty clay, very dark brown (10YR 2/2) moist; weak medium and coarse prismatic structure parting to weak fine and medium subangular blocky; hard, firm, sticky and plastic; shiny coatings on vertical faces of peds; neutral; clear wavy boundary.

B22tca—13 to 23 inches; grayish brown (2.5Y 5/2) silty clay, very dark grayish brown (2.5Y 3/2) moist; moderate medium and coarse prismatic structure parting to moderate fine and medium subangular blocky; very hard, firm, sticky and plastic; shiny coatings on faces of peds; few fine accumulations of carbonate; strong effervescence; mildly alkaline; gradual wavy boundary.

B3ca—23 to 35 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak medium and coarse prismatic structure parting to moderate fine and medium subangular blocky; very hard, firm, sticky and plastic; few very dark gray (10YR 3/1) tongues; common fine and medium accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

C1ca—35 to 41 inches; light brownish gray (2.5Y 6/2) and light yellowish brown (2.5Y 6/4) silty clay, dark grayish brown (2.5Y 4/2) and olive brown (2.5Y 4/4) moist; common fine faint grayish brown (2.5Y 5/2) and few fine distinct very dark brown (10YR 2/2) mottles; weak medium and coarse prismatic structure parting to weak fine and medium subangular blocky; very hard, firm, sticky and plastic; common fine and medium accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

C2—41 to 60 inches; light yellowish brown (2.5Y 6/4) silty clay, olive brown (2.5Y 4/4) moist; common fine faint dark yellowish brown (10YR 4/6) and many fine distinct dark gray (10YR 4/1) mottles; massive; hard, friable, sticky and plastic; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 26 to 54 inches. The depth to free carbonates ranges from 8 to 22 inches. The thickness of the mollic epipedon ranges from 20 to 36 inches.

The A horizon has value of 3 or 4 (2 or 3 moist) and chroma of 1 or 2. It typically is silty clay loam but in some pedons is silt loam. It is slightly acid or neutral. The B2t horizon has value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2. It is silty clay, clay loam, clay, or silty clay loam. It is neutral or mildly alkaline. The C horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 to 7 (4 or 5 moist), and chroma of 2 to 4. It is silty clay or silty clay loam. Its mottles are inherited from the parent material. Gypsum crystals are in some pedons.

Millboro Variant

The Millboro Variant consists of deep, well drained soils formed in clayey sediments on foot slopes, alluvial fans, and high terraces. Permeability is slow in the soil material and very slow in the underlying mudstone. Slopes range from 0 to 6 percent.

Millboro Variant soils commonly are near Houdek, Lane, and Onita soils. Houdek soils formed in glacial till. They are on uplands. Lane and Onita soils are moderately well drained. Lane soils are on foot slopes, and Onita soils are in swales.

Typical pedon of Millboro Variant silty clay, 0 to 2 percent slopes, 1,150 feet north and 100 feet west of the southeast corner of sec. 19, T. 102 N., R. 66 W.

Ap—0 to 5 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; weak medium and coarse subangular blocky structure parting to weak fine granular; hard, friable, sticky and slightly plastic; many fine and medium roots; neutral; abrupt smooth boundary.

B21t—5 to 13 inches; grayish brown (2.5Y 5/2) clay, very dark grayish brown (2.5Y 3/2) moist; black (10YR 2/1) tongues; moderate medium and coarse prismatic structure parting to weak and moderate medium blocky and subangular blocky; hard, firm, sticky and plastic; common fine and medium roots; strong effervescence; mildly alkaline; gradual wavy boundary.

B22t—13 to 21 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; black (10YR 2/1) tongues; moderate coarse prismatic structure parting to moderate fine and medium angular and subangular blocky; very hard, firm, very sticky and plastic; common fine and medium roots; strong effervescence; moderately alkaline; gradual wavy boundary.

B3—21 to 31 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; black (10YR 2/1 tongues; weak medium and coarse subangular blocky structure; very hard, firm, very sticky and plastic; common fine and medium roots; strong effervescence; moderately alkaline; gradual wavy boundary.

C1cacs—31 to 42 inches; light brownish gray (2.5Y 6/2) clay, grayish brown (2.5Y 5/2) moist; common fine and medium distinct yellowish brown (10YR 5/6) and dark gray (N 4/0) and few fine distinct very dark brown (10YR 2/2) mottles; massive; very hard, firm, sticky and plastic; few fine roots; common fine nests and threads of gypsum crystals; common fine and medium accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

Cr—42 to 60 inches; light brownish gray (2.5Y 6/2) clayey mudstone, grayish brown (2.5Y 5/2) moist; common medium distinct dark gray (2.5Y 4/1), yellowish brown (10YR 5/6), light olive brown (2.5Y 5/4), and gray (5Y 6/1) mottles; extremely hard, extremely firm, very sticky and very plastic; common fine and medium nests and threads of gypsum crystals; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 24 to 40 inches. The depth to free carbonates ranges from 0 to 8 inches. The mollic epipedon is 7 to 10 inches thick and includes part of the B2 horizon in some pedons. The depth to clayey mudstone ranges from 40 to 60 inches.

The Ap horizon has hue of 10YR or 2.5Y, value of 4 or 5 (2 or 3 moist), and chroma of 1 or 2. It is neutral or mildly alkaline. The B horizon has hue of 2.5Y or 5Y, value of 4 to 6 (2 to 4 moist), and chroma of 1 to 3. It is mildly alkaline or moderately alkaline. The C horizon has hue of 2.5Y or 5Y, value of 6 or 7 (5 or 6 moist), and chroma of 1 to 3. It has few or common nests of gypsum. Its mottles are inherited from the parent material.

Onita series

The Onita series consists of deep, moderately well drained soils formed in alluvium in swales on uplands. Permeability is moderately slow. Slopes range from 0 to 2 percent.

Onita soils are similar to Lane soils and commonly are near DeGrey, Eakin, Highmore, Hoven, and Plankinton soils. Lane soils have carbonates within a depth of 20 inches. DeGrey soils have a natric horizon. They are on short, concave side slopes and in plane areas. Eakin and Highmore soils are well drained. They are on the slightly higher rises. Hoven and Plankinton soils are poorly drained. They are in depressions.

Typical pedon of Onita silt loam, in an area of Highmore-Onita silt loams, 0 to 2 percent slopes, 160 feet east and 750 feet south of the northwest corner of sec. 9, T. 105 N., R. 65 W.

Ap—0 to 7 inches; very dark gray (10YR 3/1) silt loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, friable; medium acid; abrupt smooth boundary.

A12—7 to 12 inches; very dark gray (10YR 3/1) silt loam, black (10YR 2/1) moist; weak fine and medium subangular blocky structure; slightly hard, friable; medium acid; clear smooth boundary.

B21t—12 to 20 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak medium prismatic structure parting to moderate fine and medium subangular blocky; hard, firm, slightly sticky and slightly plastic; slightly acid; gradual wavy boundary.

B22t—20 to 35 inches; very dark gray (10YR 3/1) silty clay, black (10YR 2/1) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; hard, firm, sticky and plastic; slightly acid; gradual wavy boundary.

B3—35 to 47 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; common fine distinct yellowish brown (10YR 5/6) and black (10YR 2/1) mottles; weak coarse prismatic structure parting to weak medium and coarse subangular blocky; hard, firm, sticky and plastic; mildly alkaline; gradual wavy boundary.

C—47 to 60 inches; light brownish gray (2.5Y 6/3) silty clay loam, grayish brown (2.5Y 5/3) moist; common fine distinct strong brown (7.5YR 5/6) and common fine faint gray (5Y 5/1) mottles; massive; hard, firm, slightly sticky and slightly plastic; mildly alkaline.

The thickness of the solum ranges from 28 to 54 inches. The depth to free carbonates ranges from 22 to 40 inches or more. The thickness of the mollic epipedon ranges from 25 to 40 inches.

The A horizon has value of 3 or 4 (2 or 3 moist) and chroma of 1 or 2. It ranges from medium acid to neutral. The B2t horizon has hue of 10YR or 2.5Y, value of 3 to 5 (2 to 4 moist), and chroma of 1 to 3. It is silty clay, silty clay loam, or clay loam. It is slightly acid or neutral. The C horizon has hue of 10YR or 2.5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 to 4. It is silty clay loam, silty clay, or clay loam. It is mildly alkaline or moderately alkaline.

Plankinton series

The Plankinton series consists of deep, poorly drained soils formed in alluvium underlain by glacial till. Permeability is slow or very slow. These soils are in depressions in the uplands. Slopes are 0 to 1 percent.

Plankinton soils are similar to Hoven and Tetonka soils and commonly are near Dudley, Houdek, Hoven, Onita, and Prosper soils. Dudley, Onita, and Prosper soils are moderately well drained. Houdek soils are well drained. They are on the slightly higher parts of the landscape. Hoven soils have a natric horizon. The A horizon of Tetonka soils is thicker than that of the Plankinton soils. Hoven and Tetonka soils are in the same positions on the landscape as the Plankinton soils.

Typical pedon of Plankinton silt loam, in an area of Hoven-Plankinton silt loams, 2,050 feet north and 230 feet east of the southwest corner of sec. 26, T. 101 N., R. 65 W.

A1—0 to 4 inches; dark gray (10YR 4/1) silt loam, very dark gray (10YR 3/1) moist; weak very thin platy structure parting to weak fine granular; slightly hard, very friable; many fine and few medium roots; slightly acid; clear smooth boundary.

A2—4 to 8 inches; light gray (10YR 7/1) silt loam, dark gray (10YR 4/1) moist; common fine distinct yellowish brown (10YR 5/4) mottles; weak thin and medium platy structure parting to weak fine subangular blocky; slightly hard, very friable; common fine roots; few fine concretions (iron and manganese oxide); few fine vertical pores; neutral; abrupt smooth boundary.

B21t—8 to 19 inches; dark gray (10YR 4/1) silty clay, black (10YR 2/1) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; very hard, firm, sticky and plastic; common fine roots; few fine concretions (iron and manganese oxide); neutral; gradual wavy boundary.

B22t19 to 28 inches; dark gray (10YR 4/1) silty clay, black (10YR 2/1) moist; moderate medium and coarse prismatic structure parting to weak medium subangular blocky; very hard, firm, sticky and plastic; few fine roots; few fine concretions (iron and manganese oxide); moderately alkaline; clear wavy boundary.

B3ca—28 to 40 inches; dark gray (10YR 4/1) and grayish brown (2.5Y 5/2) silty clay loam, very dark gray (10YR 3/1) and dark gray (N 4/0) moist; weak medium and coarse prismatic structure parting to moderate fine and medium subangular blocky; hard, firm, slightly sticky, slightly plastic; few fine roots; few fine concretions (iron and manganese oxide); common patches of carbonate on vertical faces of peds; strong effervescence; moderately alkaline; gradual wavy boundary.

C1ca—40 to 55 inches; light gray (2.5Y 7/2) clay loam, grayish brown (2.5Y 5/2) moist; common fine and medium distinct yellowish brown (10YR 5/6), common fine distinct dark reddish brown (5YR 2/2), and common medium faint dark gray (N 4/0) mottles; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine concretions (iron and manganese oxide); few fine accumulations of carbonate; violent effervescence; moderately alkaline; gradual wavy boundary.

C2ca—55 to 60 inches; light gray (2.5Y 7/2) and light yellowish brown (2.5Y 6/4) clay loam, grayish brown (2.5Y 5/2) and light olive brown (2.5Y 5/4) moist; common fine distinct strong brown (7.5YR 5/6) mottles; massive; slightly hard, friable, slightly sticky and slightly plastic; common fine concretions (iron and manganese oxide); few fine accumulations of carbonate; strong effervescence; moderately alkaline.

The thickness of the solum and the depth to carbonates range from 24 to 50 inches. The thickness of the mollic epipedon also ranges from 24 to 50 inches.

The A1 horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It ranges from medium acid to neutral and is 3 to 6 inches thick. The A2 horizon has value of 5 to 7 (4 or 5 moist) and chroma of 1 or 2. It is 2 to 5 inches thick. The B2t horizon has hue of 10YR or 2.5Y and value of 3 to 5 (2 or 3 moist). It is silty clay, clay loam, silty clay loam, or clay. It ranges from slightly acid to moderately alkaline. The C horizon has hue of 2.5Y or 5Y, value of 4 to 7 (3 to 5 moist), and chroma of 4 or less. It is clay loam, silty clay loam, loam, clay, or silty clay. Buried horizons and thin lenses of sand, sandy loam, and gravelly sand are below a depth of 40 inches in some pedons. Gypsum crystals are in the B3 and C horizons in some pedons.

Prosper series

The Prosper series consists of deep, moderately well drained soils that formed in alluvium over glacial till. Permeability is moderate in the subsoil and moderately slow in the underlying material. These soils are in swales in the uplands. Slopes range from 0 to 2 percent.

Prosper soils commonly are near Clarno, Houdek, Hoven, Plankinton, and Tetonka soils. Clarno and Houdek soils have a mollic epipedon that is less than 20 inches thick. They are on the slightly higher parts of the landscape. Hoven, Plankinton, and Tetonka soils are poorly drained and are in depressions.

Typical pedon of Prosper loam, in an area of Clarno-Prosper loams, 0 to 3 percent slopes, 1,018 feet east and 2,413 feet south of the northwest corner of sec. 6, T. 105 N., R. 63 W.

Ap—0 to 8 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak fine granular structure; soft, very friable; medium acid; abrupt smooth boundary.

A12—8 to 12 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak medium and coarse subangular blocky structure parting to weak fine granular; slightly hard, friable; slightly acid; clear smooth boundary.

B21t—12 to 21 inches; dark grayish brown (10YR 4/2) clay loam, very dark brown (10YR 2/2) moist; moderate medium and coarse prismatic structure parting to moderate fine and medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; neutral; clear wavy boundary.

B22t—21 to 27 inches; grayish brown (2.5Y 5/2) clay loam, very dark grayish brown (2.5Y 3/2) moist; moderate medium and coarse prismatic structure parting to moderate fine and medium subangular blocky; hard, friable, slightly sticky and slightly plastic; thin shiny films on faces of peds; neutral; clear wavy boundary.

B3ca—27 to 33 inches; light brownish gray (2.5Y 6/3) clay loam, grayish brown (2.5Y 5/3) moist; weak medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and medium accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

C1ca—33 to 43 inches; light gray (2.5Y 7/3) clay loam, grayish brown (2.5Y 5/3) moist; few fine distinct olive yellow (2.5Y 6/6) mottles; massive; slightly hard, friable, slightly sticky and slightly plastic; common fine and medium accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

C2—43 to 60 inches; light gray (2.5Y 7/3) clay loam, grayish brown (2.5Y 5/3) moist; few fine distinct olive yellow (2.5Y 6/6) and gray (N 5/0) mottles; massive; soft, friable, slightly sticky and slightly plastic; few fine and medium accumulations of carbonate; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 24 to 45 inches. The depth to carbonates ranges from 20 to 36 inches. The thickness of the mollic epipedon ranges from 20 to 30 inches.

The A horizon has value of 3 or 4 (2 or 3 moist) and chroma of 1 or 2. It ranges from medium acid to mildly alkaline. The B2t horizon has value of 3 to 5 (2 to 4 moist) and chroma of 1 to 3. It is clay loam or silty clay loam. It is neutral or mildly alkaline. The C horizon has value of 5 to 7 (4 to 6 moist) and chroma of 2 to 4. It is clay loam or loam. It is mildly alkaline or moderately alkaline. Some pedons have gypsum crystals below a depth of 40 inches.

Talmo series

The Talmo series consists of excessively drained soils that are very shallow over gravelly sand. Permeability is rapid. These soils formed in glacial outwash on uplands. Slopes range from 2 to 40 percent.

Talmo soils commonly are near Delmont and Enet soils. These nearby soils are underlain by gravelly sand below a depth of 14 inches. They are on the less sloping parts of the landscape.

Typical pedon of Talmo gravelly loam, in an area of Talmo-Delmont complex, 15 to 40 percent slopes, 300 feet south and 2,500 feet west of the northeast corner of sec. 8, T. 105 N., R. 66 W.

A1—0 to 9 inches; very dark gray (10YR 3/1) gravelly loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, very friable; many fine roots; slight effervescence; mildly alkaline; clear wavy boundary.

IIC1ca—9 to 13 inches; grayish brown (10YR 5/2) gravelly sand, dark grayish brown (10YR 4/2) moist; single grain; loose; common fine roots; carbonate coatings on the undersides of pebbles; strong effervescence; mildly alkaline; gradual wavy boundary.

IIC2ca—13 to 42 inches; multicolored gravelly sand; single grain; loose; carbonate coatings on the undersides of pebbles; strong effervescence; mildly alkaline; gradual wavy boundary.

IIC3—42 to 60 inches; multicolored gravelly sand; single grain; loose; slight effervescence; moderately alkaline.

The solum and the mollic epipedon range from 7 to 14 inches in thickness. The depth to free carbonates ranges from 0 to 10 inches.

The A horizon has value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2. It is 7 to 10 inches thick and is neutral or mildly alkaline. It typically is gravelly loam but in some pedons is loam or sandy loam.

Tetonka series

The Tetonka series consists of deep, poorly drained soils formed in alluvium underlain by glacial till. Permeability is very slow. These soils are in depressions in the uplands. Slopes are less than 1 percent.

Tetonka soils are similar to Plankinton and Worthing soils and commonly are near Hoven, Onita, Plankinton, Prosper, and Worthing soils. The A horizon of Hoven and Plankinton soils is thinner than that of the Tetonka soils. Onita and Prosper soils are moderately well drained and are in swales. Worthing soils do not have an A2 horizon. Hoven, Plankinton, and Worthing soils are in the same positions on the landscape as the Tetonka soils.

Typical pedon of Tetonka silt loam, 1,520 feet north and 730 feet east of the southwest corner of sec. 34, T. 105 N., R. 63 W.

A1—0 to 7 inches; gray (10YR 5/1) silt loam, very dark gray (10YR 3/1) moist; common fine and medium distinct yellowish brown (10YR 5/8) mottles; weak fine and medium subangular blocky structure parting to weak thin platy; slightly hard, very friable; many roots; medium acid; clear wavy boundary.

A2—7 to 12 inches; light gray (10YR 7/1) silt loam, gray (10YR 5/1) moist; common fine and medium distinct light olive brown (2.5Y 5/4) mottles; weak thin platy structure parting to weak fine granular; slightly hard, very friable; many roots; medium acid; clear wavy boundary.

B21t—12 to 18 inches; gray (5Y 5/1) clay, very dark gray (5Y 3/1) moist; light gray (10YR 7/1) tongues in the upper part; moderate medium and coarse prismatic structure parting to moderate medium subangular blocky; very hard, firm, sticky and plastic; few roots; shiny films on faces of peds; slightly acid; clear wavy boundary.

B22t—18 to 29 inches; gray (5Y 5/1) clay, very dark gray (5Y 3/1) moist; weak medium and coarse prismatic structure parting to moderate medium subangular blocky; very hard, firm, sticky and plastic; few roots; shiny films on faces of peds; slightly acid; gradual wavy boundary.

B23t—29 to 35 inches; gray (5Y 5/1) clay, dark gray (5Y 4/1) moist; few fine and medium distinct brownish yellow (10YR 6/8) mottles; moderate medium and coarse prismatic structure parting to moderate medium subangular blocky; very hard, firm, sticky and plastic; few roots; shiny patchy films on the vertical faces of peds; neutral; abrupt wavy boundary.

B3ca—35 to 44 inches; light gray (5Y 6/1) clay loam, gray (5Y 5/1) moist; few fine and medium distinct brownish yellow (10YR 6/8) mottles; weak medium and coarse prismatic structure parting to moderate medium and coarse subangular blocky; hard, friable, sticky and plastic; few roots; few fine concretions (iron and manganese oxide); many fine and medium accumulations of carbonate; strong effervescence; mildly alkaline; gradual wavy boundary.

Cca—44 to 60 inches; light olive gray (5Y 6/2) clay loam, olive gray (5Y 5/2) moist; many medium and coarse prominent brownish yellow (10YR 6/8) mottles; massive; hard, friable, slightly sticky and slightly plastic; many fine and medium accumulations of carbonate; strong effervescence; mildly alkaline.

The thickness of the solum ranges from 28 to 60 inches or more. The thickness of the mollic epipedon ranges from 24 to 50 inches. The depth to free carbonates ranges from 36 to more than 60 inches. An organic layer 1 to 2 inches thick is at the surface in some pedons.

The A1 horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It typically is silt loam but in some pedons is silty clay loam. It is 6 to 10 inches thick. The A2 horizon has value of 5 to 7 (4 or 5 moist) and chroma of 1 or 2. It is silt loam or silty clay loam. The A horizon ranges from medium acid to neutral. Some pedons have a B&A or A&B horizon, which is 2 to 4 inches thick. The B2t horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 or 5 (2 to 4 moist), and chroma of 1 or 2. It is silty clay loam, clay loam, silty clay, or clay. It ranges from slightly acid to mildly alkaline. The C horizon has hue of 2.5Y or 5Y, value of 5 to 7 (4 to 6 moist), and chroma of 1 to 4. It is silty clay, clay, or clay loam. Gypsum crystals are in some pedons.

Worthing series

The Worthing series consists of deep, very poorly drained soils formed in clayey and silty alluvium in depressions on uplands. Permeability is slow. Slopes are less than 1 percent.

Worthing soils are similar to Plankinton and Tetonka soils and commonly are near Hoven, Onita, Plankinton, Prosper, and Tetonka soils. Hoven, Plankinton, and Tetonka soils have an A2 horizon. They are in the same positions on the landscape as the Worthing soils. Onita and Prosper soils are moderately well drained and are in swales.

Typical pedon of Worthing silty clay loam, 75 feet north and 800 feet west of the southeast corner of sec. 27, T. 103 N., R. 65 W.

A1—0 to 8 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; moderate fine and medium granular structure; slightly hard, friable; many fine roots; neutral; clear wavy boundary.

B21t—8 to 15 inches; dark gray (10YR 4/1) silty clay, black (10YR 2/1) moist; weak medium and coarse prismatic structure parting to moderate fine and medium subangular blocky; very hard, firm, sticky and plastic; common fine roots; neutral; gradual wavy boundary.

B22t—15 to 23 inches; gray (10YR 5/1) silty clay, very dark gray (10YR 3/1) moist; weak medium prismatic structure parting to moderate fine and medium subangular blocky; very hard, firm, sticky and plastic; few fine and medium roots; neutral; gradual wavy boundary.

B23tg—23 to 30 inches; gray (5Y 5/1) silty clay, very dark gray (5Y 3/1) moist; weak medium and coarse prismatic structure parting to moderate fine and medium subangular blocky; very hard, firm, sticky and plastic; few medium roots; neutral; gradual wavy boundary.

B3g—30 to 36 inches; gray (5Y 5/1) silty clay, very dark gray (5Y 3/1) moist; weak fine and medium subangular blocky structure; very hard, firm, sticky and plastic; few fine accumulations of carbonate; mildly alkaline; gradual wavy boundary.

Cgca—36 to 60 inches; light gray (5Y 7/1) silty clay loam, gray (5Y 5/1) moist; common fine and medium distinct yellowish brown (10YR 5/4), few fine faint gray (10YR 6/1), and few fine and medium distinct very dark brown (10YR 2/2) mottles; massive; hard, firm, slightly sticky and slightly plastic; common fine and medium accumulations of carbonate; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 35 to 55 inches. The depth to free carbonates and the thickness of the mollic epipedon range from 35 to more than 60 inches.

The A horizon has hue of 10YR or 2.5Y and value of 3 or 4 (2 or 3 moist). It typically is silty clay loam but in some pedons is silty clay. It ranges from medium acid to neutral. The B2 horizon has hue of 10YR, 5Y, or 2.5Y and value of 3 to 5 (2 or 3 moist). It is silty clay or clay. It is slightly acid or neutral. The B3 horizon has hue of 5Y or 2.5Y, value of 5 or 6 (2 to 5 moist), and chroma of 1 or 2. It is silty clay, silty clay loam, or clay. It ranges from neutral to moderately alkaline. The C horizon has value of 4 to 8 (3 to 6 moist) and chroma of 1 or 2. It is silty clay loam, clay loam, silty clay, or clay. It ranges from neutral to moderately alkaline.

factors of soil formation

Soil forms when chemical and physical processes act on geologically deposited or accumulated material. The characteristics of the soil at any given point are determined by the physical and mineralogical composition of the parent material, the climate under which the soil material has accumulated and existed since accumualtion, the plant and animal life on and in the soil, the relief, and the length of time that the forces of soil formation have acted on the soil material.

Climate and plant and animal life, chiefly plants, are active factors of soil formation. They act on the parent material and slowly change it to a natural body that has genetically related horizons. The effects of climate and plant and animal life are conditioned by relief. The parent material also affects the kind of soil profile that forms and, in extreme cases, determines it almost entirely. Finally, time is needed for changing the parent material into a soil having genetically related horizons. Some time is always required for the differentiation of soil horizons. Usually, a long time is required for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other four. The following paragraphs relate the factors of soil formation to the soils in Aurora County.

climate

Climate directly influences the rate of chemical and physical weathering. Aurora County has a continential climate marked by cold winters and hot summers. The average annual air temperature is about 47 degrees F. The average annual precipitation is about 21 inches, of which about 75 percent falls during the period April through September.

This climate favors the growth of grasses and the resulting accumulation of organic matter in the upper part of the soil. The precipitation is sufficient to leach carbonates in most soils to an average depth of about 20 inches. The climate is generally uniform throughout the county and thus as a separate factor does not differentiate the soils within the county. Additional climatic data are given under the heading "General nature of the county."

plant and animal life

Living organisms have an important effect on soil formation. These include plants, animals, insects, earthworms, bacteria, and fungi. In Aurora County the tall and mid prairie grasses have had more influence than other living organisms on soil formation. As a result of these grasses, the surface layer of many soils has a moderate or high content of organic matter. Prosper soils, for example, have a high content of organic matter.

Earthworms, cicadas, and burrowing animals help to keep the soil open and porous. Bacteria and fungi decompose plant residue, thus releasing nutrients that plants use as food.

parent material

Most of the soils in Aurora County formed in glacial material that was derived from preglacial formations of granite, gneiss, limestone, sandstone, and shale. The glacier ground up and mixed these materials as it transported them. It then redeposited them as it melted. Some deposits are unsorted material, or glacial till; others are material sorted either by water during deposition or by wind and water after deposition.

Silty drift is material that was deposited on glacial ice and then reworked by water as the glacier melted. Highmore soils formed in silty drift. Eakin soils formed in a thin mantle of silty glacial drift over glacial till.

Glacial till is a mixture of clay, silt, sand, and gravel that contains few to many cobblestones and boulders. The content of pebbles and cobblestones is higher than that in silty glacial drift. The proportion of each kind of material is determined by the kind of material picked up by the glacier. Among the soils formed in glacial till are Betts, Clarno, and Ethan.

Glacial outwash is sandy, gravelly, and loamy material deposited by glacial melt water. Alwilda, Delmont, Enet, and Talmo soils formed in loamy glacial outwash underlain by sand and gravel within a depth of 40 inches. The outwash deposits occur as thin mantles over glacial till or glacial drift in some areas. Blendon soils are in areas where loamy and sandy outwash sediments are more than 40 inches thick.

Onita, Plankinton, Prosper, and Tetonka are examples of soils formed partly or entirely in local alluvium washed in from adjacent sloping soils on uplands. Bon and Clamo soils formed in alluvium deposited by streams.

relief

Relief affects drainage, runoff, erosion, plant cover, and soil temperature. Betts soils, for example, lose much rainfall because of excessive runoff. A limited amount of moisture penetrates the surface, and soil is lost through erosion. These soils are calcareous at or near the surface. The layers in which organic matter accumulates are thin.

The runoff rate is slower on Clarno, Highmore, and Houdek soils than on Betts soils. As a result, more moisture penetrates the surface and the layers in which organic matter accumulates are thicker. Also, these soils are calcareous at a depth of more than 10 inches.

Onita and Prosper soils are in swales that receive extra moisture in the form of runoff from adjacent soils. The layers in which organic matter accumulates are thicker than those in Clarno, Highmore, and Houdek soils. Also, carbonates are leached to a greater depth.

Drainage is impeded in some low areas. The high, fluctuating water table in the soils in these areas favors the concentration of carbonates near the surface. Arlo soils are an example.

time

The length of time that climate, plant and animal life, and relief have affected the parent material helps to determine the kind of soil that forms. All of the soils in Aurora County are young. The youngest are those on active flood plains, such as Bon and Clamo soils.

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glossary

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compact layers to depths below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Crop residue management. Using that part of a crop or plant left in the field after harvest for protection or improvement of the soil.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Drainage class (natural). Refers to the removal of water from the soil. Drainage classes are determined on the basis of an overall evaluation of water removal as influenced by climate, slope, and position on the landscape. Precipitation, runoff, amount of moisture infiltrating the soil, and rate of water movement through the soil affect the degree and duration of wetness. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. The soils in this class generally are free of mottles throughout. They commonly are shallow, very porous, or steep, or a combination of these.

Somewhat excessively drained.—Water is removed from the soil rapidly. The soils in this class generally are free of mottles throughout. They commonly are shallow or moderately deep, very porous, or steep, or a combination of these.

Well drained.—Water is removed from the soil so readily that the upper 40 inches generally does not have the mottles or dull colors related to wetness.

Moderately well drained.—Water is removed from the soil so slowly that the upper 20 to 40 inches has the mottles or dull colors related to wetness. The soils in this class commonly have a slowly permeable layer, have a water table, or receive runoff or seepage, or they are characterized by a combination of these.

Somewhat poorly drained.—Water is removed from the soil so slowly that the upper 10 to 20 inches has the mottles or dull colors related to wetness. The soils in this class commonly have a slowly permeable layer, have a water table, or receive runoff or seepage, or they are characterized by a combination of these.

Poorly drained.—Water is removed so slowly that either the soil is periodically saturated or the upper 10 inches has the mottles or dull colors related to wetness. The soils in this class commonly have a slowly permeable layer, have a water table, or receive runoff or seepage, or they are characterized by a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water is at or on the surface most of the time. The soils in this class commonly have a slowly permeable layer, have a water table, or receive runoff or seepage, or they are characterized by a combination of these.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Excess salts (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grains are grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial melt water.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. The soil is not strong enough to support loads.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.20 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Ponding. Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use. Controlling the intensity of grazing so that the plant cover protects the soil, the quality of desirable vegetation is improved or maintained, and the quantity is increased or maintained.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor, on the basis of how much the present plant community has departed from the potential.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slow intake (in tables). The slow movement of water into the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons.

Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from soil blowing and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the profile below plow depth.

Subsoiling. Breaking up a compact subsoil by pulling a special chisel through the soil.

Subsurface layer. Any surface soil horizon (A1, A2, or A3) below the surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A horizon. Includes all subdivisions of this horizon (A1, A2, and A3).

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Data were recorded in the period 1951-77 at White Lake, South Dakota]

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	27.0	4.6	15.8	55	-27	0	.40	.09	.64	2	4.3
February---	34.2	11.6	22.9	64	-21	21	.72	.20	1.14	2	6.9
March------	43.2	20.6	31.9	76	-10	100	1.20	.45	1.79	3	7.2
April------	61.2	34.4	47.8	89	12	261	2.35	1.22	3.26	5	2.6
May--------	73.1	45.7	59.4	93	24	601	3.38	1.76	4.70	6	.1
June-------	82.4	56.1	69.3	102	39	879	3.62	1.93	5.00	7	.0
July-------	89.5	61.2	75.4	105	45	1,097	2.54	1.01	3.77	5	.0
August-----	88.1	59.5	73.8	104	44	1,048	2.61	.83	4.03	5	.0
September--	77.2	48.6	62.9	100	28	687	2.00	.56	3.15	4	.0
October----	65.4	37.4	51.5	89	16	370	1.24	.28	2.00	3	.9
November---	45.9	23.1	34.5	74	-4	48	.81	.18	1.31	2	3.7
December---	32.2	10.9	21.4	61	-20	11	.57	.17	.89	2	6.5
Yearly:											
Average--	60.0	34.5	47.2	---	---	---	---	---	---	---	---
Extreme--	---	---	---	107	-27	---	---	---	---	---	---
Total----	---	---	---	---	---	5,123	21.44	16.82	25.53	46	32.2

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* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Data were recorded in the period 1951-77 at White Lake, South Dakota]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	June 10	June 29	July 5
2 years in 10 later than--	May 17	June 3	June 8
5 years in 10 later than--	March 31	April 14	April 17
First freezing temperature in fall:			
1 year in 10 earlier than--	October 9	September 25	September 18
2 years in 10 earlier than--	October 13	September 30	September 22
5 years in 10 earlier than--	October 23	October 11	October 1

TABLE 3.--GROWING SEASON

[Data were recorded in the period 1951-77 at White Lake, South Dakota]

Probability	Daily minimum temperature		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	139	104	89
8 years in 10	161	130	115
5 years in 10	205	179	166
2 years in 10	248	228	216
1 year in 10	271	254	243

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
AaA	Alwilda loam, 0 to 2 percent slopes	615	0.1
Ar	Arlo loam	900	0.2
BaA	Beadle loam, 0 to 3 percent slopes	1,740	0.4
BaB	Beadle loam, 3 to 6 percent slopes	935	0.2
BdA	Beadle-Dudley complex, 0 to 3 percent slopes	17,020	3.7
BeE	Betts-Ethan loams, 15 to 40 percent slopes	1,020	0.2
BnA	Blendon fine sandy loam, 0 to 3 percent slopes	930	0.2
BnB	Blendon fine sandy loam, 3 to 6 percent slopes	1,740	0.4
Bo	Bon loam	1,585	0.4
Bx	Bon loam, channeled	5,000	1.1
Ca	Clamo silty clay loam	510	0.1
CbB	Clarno loam, 3 to 6 percent slopes	7,605	1.7
CeC	Clarno-Ethan loams, 6 to 9 percent slopes	2,620	0.6
CpA	Clarno-Prosper loams, 0 to 3 percent slopes	17,105	3.7
DaA	DeGrey-Jerauld silt loams, 0 to 2 percent slopes	2,880	0.6
DeA	DeGrey-Onita silt loams, 0 to 2 percent slopes	9,790	2.1
DmA	Delmont-Enet loams, 0 to 2 percent slopes	2,950	0.7
DmB	Delmont-Enet loams, 2 to 6 percent slopes	10,540	2.3
DnC	Delmont-Talmo complex, 6 to 15 percent slopes	2,730	0.6
Do	Dimo loam	935	0.2
DsA	Dudley-Jerauld silt loams, 0 to 2 percent slopes	23,465	5.1
Du	Durrstein silt loam	6,860	1.5
EdA	Eakin-DeGrey silt loams, 0 to 3 percent slopes	4,850	1.1
EeB	Eakin-Ethan complex, 2 to 6 percent slopes	9,060	2.0
EnA	Enet loam, 0 to 2 percent slopes	1,675	0.4
EtD	Ethan-Betts loams, 9 to 15 percent slopes	4,710	1.0
HbA	Highmore-Onita silt loams, 0 to 2 percent slopes	10,605	2.3
HdA	Houdek-Dudley complex, 0 to 3 percent slopes	104,880	22.9
HdB	Houdek-Dudley complex, 3 to 6 percent slopes	18,925	4.1
HeB	Houdek-Ethan loams, 2 to 6 percent slopes	49,125	10.7
HeC	Houdek-Ethan loams, 6 to 9 percent slopes	16,440	3.6
HhA	Houdek-Hoven complex, 0 to 3 percent slopes	5,745	1.3
HhB	Houdek-Hoven complex, 1 to 6 percent slopes	4,275	0.9
HoB	Houdek-Plankinton complex, 1 to 6 percent slopes	1,655	0.4
HpA	Houdek-Prosper loams, 0 to 3 percent slopes	39,040	8.5
Hv	Hoven silt loam	9,770	2.1
Hw	Hoven-Plankinton silt loams	22,495	4.9
La	Lane silty clay loam	550	0.1
MaA	Millboro Variant silty clay, 0 to 2 percent slopes	900	0.2
MaB	Millboro Variant silty clay, 2 to 6 percent slopes	425	0.1
Oa	Onita silt loam	1,865	0.4
Pg	Pits, gravel	200	*
Pt	Plankinton-Prosper complex	14,275	3.1
TaC	Talmo gravelly loam, 2 to 15 percent slopes	285	0.1
TdE	Talmo-Delmont complex, 15 to 40 percent slopes	440	0.1
Te	Tetonka silt loam	5,095	1.1
Wo	Worthing silty clay loam	2,855	0.6
Wp	Worthing silty clay loam, ponded	4,400	1.0
	Water	4,225	0.9
	Total	458,240	100.0

* Less than 0.1 percent.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Only arable soils are listed. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Corn	Oats	Grain sorghum	Alfalfa hay	Bromegrass-alfalfa
	Bu	Bu	Bu	Ton	AUM*
AaA Alwilda	42	45	40	1.7	2.8
BaA Beadle	50	57	54	2.8	4.7
BaB Beadle	48	55	52	2.7	4.5
BdA Beadle-Dudley	40	46	43	2.2	3.6
BnA Blendon	50	50	45	2.0	3.3
BnB Blendon	48	48	42	1.9	3.2
Bo Bon	63	75	70	3.3	5.5
Ca Clamo	50	51	46	2.8	4.7
CbB Clarno	56	64	55	2.7	4.5
CeC Clarno-Ethan	43	51	43	2.4	4.0
CpA Clarno-Prosper	62	69	62	2.9	4.8
DaA DeGrey-Jerauld	20	26	25	1.0	1.7
DeA DeGrey-Onita	39	47	44	2.0	3.2
DmA Delmont-Enet	32	39	29	1.6	2.7
DmB Delmont-Enet	27	33	26	1.4	2.3
Do Dimo	50	65	41	2.5	4.2
DsA Dudley-Jerauld	20	26	25	1.0	1.7
EdA Eakin-DeGrey	40	49	45	2.0	3.3
EeB Eakin-Ethan	47	55	50	2.4	4.0
EnA Enet	43	49	39	2.0	3.3

See footnote at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Oats	Grain sorghum	Alfalfa hay	Bromegrass-alfalfa
	Bu	Bu	Bu	Ton	AUM*
HbA----------------------- Highmore-Onita	59	67	61	2.8	4.7
HdA----------------------- Houdek-Dudley	44	50	47	2.1	3.5
HdB----------------------- Houdek-Dudley	40	48	45	2.1	3.5
HeB----------------------- Houdek-Ethan	48	52	50	2.4	4.0
HeC----------------------- Houdek-Ethan	40	50	42	2.3	3.8
HhA----------------------- Houdek-Hoven	40	47	46	1.9	3.2
HhB----------------------- Houdek-Hoven	38	45	43	1.9	3.2
HoB----------------------- Houdek-Plankinton	42	51	44	2.7	4.5
HpA----------------------- Houdek-Prosper	59	69	62	2.8	4.7
La------------------------ Lane	53	65	57	2.8	4.7
MaA----------------------- Millboro Variant	38	52	51	2.0	3.3
MaB----------------------- Millboro Variant	36	50	48	1.9	3.2
Oa------------------------ Onita	62	70	67	3.0	5.0
Pt------------------------ Plankinton-Prosper	31	32	31	2.8	4.7

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES

[Only the soils that support rangeland vegetation suitable for grazing are listed]

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
AaA Alwilda	Sandy	Favorable	3,120	Little bluestem	25
		Normal	2,600	Needleandthread	15
		Unfavorable	1,820	Prairie sandreed	15
				Porcupinegrass	10
				Big bluestem	10
				Blue grama	10
				Leadplant	5
				Sedge	5
Ar Arlo	Wetland	Favorable	7,000	Prairie cordgrass	55
		Normal	6,400	Big bluestem	15
		Unfavorable	5,200	Sedge	15
				Indiangrass	5
				Switchgrass	5
BaA Beadle	Clayey	Favorable	3,500	Western wheatgrass	35
		Normal	2,900	Green needlegrass	30
		Unfavorable	2,000	Sideoats grama	10
				Little bluestem	5
				Big bluestem	5
				Blue grama	5
				Sedge	5
BaB Beadle	Clayey	Favorable	3,200	Western wheatgrass	30
		Normal	2,700	Green needlegrass	30
		Unfavorable	1,900	Sideoats grama	10
				Blue grama	10
				Little bluestem	5
				Big bluestem	5
				Sedge	5
BdA*:					
Beadle	Clayey	Favorable	3,500	Western wheatgrass	35
		Normal	2,900	Green needlegrass	30
		Unfavorable	2,000	Sideoats grama	10
				Little bluestem	5
				Big bluestem	5
				Blue grama	5
				Sedge	5
Dudley	Claypan	Favorable	2,800	Western wheatgrass	50
		Normal	2,300	Blue grama	15
		Unfavorable	1,600	Green needlegrass	10
				Sedge	10
				Buffalograss	5
BeE*:					
Betts	Thin Upland	Favorable	2,800	Little bluestem	40
		Normal	2,300	Sideoats grama	15
		Unfavorable	1,600	Needleandthread	10
				Blue grama	10
				Prairie dropseed	10
				Sedge	5
				Leadplant	5
Ethan	Silty	Favorable	2,900	Needlegrass	40
		Normal	2,400	Western wheatgrass	20
		Unfavorable	1,700	Little bluestem	10
				Sideoats grama	10
				Big bluestem	5
				Blue grama	5
				Sedge	5

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
BnA, BnB	Sandy	Favorable	3,500	Little bluestem	35
Blendon		Normal	2,900	Prairie sandreed	15
		Unfavorable	2,000	Big bluestem	10
				Needleandthread	10
				Blue grama	10
				Porcupinegrass	5
				Leadplant	5
				Sedge	5
Bo	Overflow	Favorable	4,700	Big bluestem	55
Bon		Normal	4,300	Needlegrass	15
		Unfavorable	3,000	Western wheatgrass	10
				Sideoats grama	5
				Leadplant	5
				Sedge	5
Bx	Overflow	Favorable	5,000	Big bluestem	70
Bon		Normal	4,500	Switchgrass	10
		Unfavorable	3,600	Sedge	5
Ca	Subirrigated	Favorable	5,500	Big bluestem	50
Clamo		Normal	5,000	Indiangrass	10
		Unfavorable	4,000	Switchgrass	10
				Sedge	10
				Prairie cordgrass	10
				Western wheatgrass	5
CbB	Silty	Favorable	3,600	Needlegrass	40
Clarno		Normal	3,000	Big bluestem	15
		Unfavorable	2,100	Little bluestem	15
				Western wheatgrass	10
				Sideoats grama	5
				Blue grama	5
				Sedge	5
CeC*:					
Clarno	Silty	Favorable	3,100	Needlegrass	40
		Normal	2,600	Little bluestem	15
		Unfavorable	1,800	Western wheatgrass	15
				Sideoats grama	10
				Big bluestem	5
				Blue grama	5
				Sedge	5
Ethan	Silty	Favorable	3,100	Needlegrass	40
		Normal	2,600	Western wheatgrass	25
		Unfavorable	1,800	Big bluestem	10
				Little bluestem	5
				Sideoats grama	5
				Blue grama	5
				Sedge	5
CpA*:					
Clarno	Silty	Favorable	3,600	Needlegrass	40
		Normal	3,000	Big bluestem	15
		Unfavorable	2,100	Little bluestem	15
				Western wheatgrass	10
				Sideoats grama	5
				Blue grama	5
				Sedge	5
Prosper	Overflow	Favorable	4,700	Big bluestem	55
		Normal	4,300	Western wheatgrass	15
		Unfavorable	3,000	Green needlegrass	10
				Sideoats grama	5
				Leadplant	5
				Sedge	5

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
DaA*:					
DeGrey	Claypan	Favorable	2,800	Western wheatgrass	45
		Normal	2,300	Green needlegrass	15
		Unfavorable	1,500	Blue grama	15
				Sedge	10
				Needleandthread	5
				Buffalograss	5
Jerauld	Thin Claypan	Favorable	1,900	Western wheatgrass	40
		Normal	1,600	Blue grama	30
		Unfavorable	1,000	Buffalograss	10
				Sedge	10
DeA*:					
DeGrey	Claypan	Favorable	2,800	Western wheatgrass	45
		Normal	2,300	Green needlegrass	15
		Unfavorable	1,500	Blue grama	15
				Sedge	10
				Needleandthread	5
				Buffalograss	5
Onita	Overflow	Favorable	4,950	Big bluestem	60
		Normal	4,500	Green needlegrass	10
		Unfavorable	3,150	Western wheatgrass	5
				Sideoats grama	5
				Little bluestem	5
				Leadplant	5
				Sedge	5
DmA*, DmB*:					
Delmont	Shallow to Gravel	Favorable	2,500	Needleandthread	60
		Normal	2,100	Sedge	10
		Unfavorable	1,300	Sideoats grama	5
				Prairie dropseed	5
				Blue grama	5
				Plains muhly	5
Enet	Silty	Favorable	3,600	Needlegrass	35
		Normal	3,000	Western wheatgrass	20
		Unfavorable	2,100	Little bluestem	15
				Big bluestem	10
				Sideoats grama	5
				Blue grama	5
				Sedge	5
DnC*:					
Delmont	Shallow to Gravel	Favorable	2,500	Needleandthread	60
		Normal	2,100	Sedge	10
		Unfavorable	1,300	Sideoats grama	5
				Prairie dropseed	5
				Blue grama	5
				Plains muhly	5
Talmo	Very Shallow	Favorable	1,800	Blue grama	40
		Normal	1,500	Needleandthread	25
		Unfavorable	900	Sideoats grama	10
				Sedge	10
				Plains muhly	5
Do Dimo	Overflow	Favorable	4,500	Big bluestem	55
		Normal	4,100	Western wheatgrass	20
		Unfavorable	2,900	Green needlegrass	15
				Leadplant	5
				Sedge	5

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
DsA*:					
Dudley	Claypan	Favorable	2,800	Western wheatgrass	50
		Normal	2,300	Blue grama	15
		Unfavorable	1,600	Green needlegrass	10
				Sedge	10
				Buffalograss	5
Jerauld	Thin Claypan	Favorable	1,900	Western wheatgrass	40
		Normal	1,600	Blue grama	30
		Unfavorable	1,000	Buffalograss	10
				Sedge	10
Du Durrstein	Saline Lowland	Favorable	3,600	Western wheatgrass	50
		Normal	3,400	Cordgrass	15
		Unfavorable	2,700	Inland saltgrass	15
				Nuttall alkaligrass	10
EdA*:					
Eakin	Silty	Favorable	3,700	Western wheatgrass	35
		Normal	3,100	Green needlegrass	20
		Unfavorable	2,200	Big bluestem	10
				Needleandthread	10
				Little bluestem	5
				Sideoats grama	5
				Blue grama	5
				Sedge	5
DeGrey	Claypan	Favorable	2,800	Western wheatgrass	45
		Normal	2,300	Green needlegrass	15
		Unfavorable	1,500	Blue grama	15
				Sedge	10
				Needleandthread	5
				Buffalograss	5
EeB*:					
Eakin	Silty	Favorable	3,700	Western wheatgrass	35
		Normal	3,100	Green needlegrass	20
		Unfavorable	2,200	Big bluestem	10
				Needleandthread	10
				Little bluestem	5
				Sideoats grama	5
				Blue grama	5
				Sedge	5
Ethan	Silty	Favorable	3,100	Needlegrass	40
		Normal	2,600	Western wheatgrass	25
		Unfavorable	1,800	Big bluestem	10
				Little bluestem	5
				Sideoats grama	5
				Blue grama	5
				Sedge	5
EnA Enet	Silty	Favorable	3,600	Needlegrass	35
		Normal	3,000	Western wheatgrass	20
		Unfavorable	2,100	Little bluestem	15
				Big bluestem	10
				Sideoats grama	5
				Blue grama	5
				Sedge	5
EtD*:					
Ethan	Silty	Favorable	2,900	Needlegrass	40
		Normal	2,400	Western wheatgrass	20
		Unfavorable	1,700	Little bluestem	10
				Sideoats grama	10
				Big bluestem	5
				Blue grama	5
				Sedge	5

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
EtD*:					
Betts	Thin Upland	Favorable	2,800	Little bluestem	40
		Normal	2,300	Sideoats grama	15
		Unfavorable	1,600	Needleandthread	10
				Blue grama	10
				Prairie dropseed	10
				Sedge	5
				Leadplant	5
HbA*:					
Highmore	Silty	Favorable	3,700	Western wheatgrass	35
		Normal	3,100	Green needlegrass	20
		Unfavorable	2,200	Big bluestem	10
				Needleandthread	10
				Little bluestem	5
				Sideoats grama	5
				Blue grama	5
				Sedge	5
Onita	Overflow	Favorable	4,950	Big bluestem	60
		Normal	4,500	Green needlegrass	10
		Unfavorable	3,150	Western wheatgrass	5
				Sideoats grama	5
				Little bluestem	5
				Leadplant	5
				Sedge	5
HdA*, HdB*:					
Houdek	Silty	Favorable	3,500	Needlegrass	40
		Normal	2,900	Big bluestem	15
		Unfavorable	2,000	Little bluestem	15
				Western wheatgrass	10
				Sideoats grama	5
				Blue grama	5
				Sedge	5
Dudley	Claypan	Favorable	2,800	Western wheatgrass	50
		Normal	2,300	Blue grama	15
		Unfavorable	1,600	Green needlegrass	10
				Sedge	10
				Buffalograss	5
HeB*, HeC*:					
Houdek	Silty	Favorable	3,500	Needlegrass	40
		Normal	2,900	Big bluestem	15
		Unfavorable	2,000	Little bluestem	15
				Western wheatgrass	10
				Sideoats grama	5
				Blue grama	5
				Sedge	5
Ethan	Silty	Favorable	3,100	Needlegrass	40
		Normal	2,600	Western wheatgrass	25
		Unfavorable	1,800	Big bluestem	10
				Little bluestem	5
				Sideoats grama	5
				Blue grama	5
				Sedge	5
HhA*, HhB*:					
Houdek	Silty	Favorable	3,500	Needlegrass	40
		Normal	2,900	Big bluestem	15
		Unfavorable	2,000	Little bluestem	15
				Western wheatgrass	10
				Sideoats grama	5
				Blue grama	5
				Sedge	5

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
HhA*, HhB*:					
Hoven	Closed Depression	Favorable	3,900	Western wheatgrass	85
		Normal	3,500	Sedge	10
		Unfavorable	2,500		
HoB*:					
Houdek	Silty	Favorable	3,500	Needlegrass	40
		Normal	2,900	Big bluestem	15
		Unfavorable	2,000	Little bluestem	15
				Western wheatgrass	10
				Sideoats grama	5
				Blue grama	5
				Sedge	5
Plankinton	Closed Depression	Favorable	3,900	Western wheatgrass	85
		Normal	3,500	Sedge	10
		Unfavorable	2,500		
HpA*:					
Houdek	Silty	Favorable	3,500	Needlegrass	40
		Normal	2,900	Big bluestem	15
		Unfavorable	2,000	Little bluestem	15
				Western wheatgrass	10
				Sideoats grama	5
				Blue grama	5
				Sedge	5
Prosper	Overflow	Favorable	4,700	Big bluestem	55
		Normal	4,300	Western wheatgrass	15
		Unfavorable	3,000	Green needlegrass	10
				Sideoats grama	5
				Leadplant	5
				Sedge	5
Hv Hoven	Closed Depression	Favorable	3,900	Western wheatgrass	85
		Normal	3,500	Sedge	10
		Unfavorable	2,500		
Hw*:					
Hoven	Closed Depression	Favorable	3,900	Western wheatgrass	85
		Normal	3,500	Sedge	10
		Unfavorable	2,500		
Plankinton	Closed Depression	Favorable	3,900	Western wheatgrass	85
		Normal	3,500	Sedge	10
		Unfavorable	2,500		
La Lane	Clayey	Favorable	3,300	Western wheatgrass	40
		Normal	2,800	Green needlegrass	30
		Unfavorable	2,000	Blue grama	10
				Big bluestem	5
				Sideoats grama	5
				Sedge	5
MaA, MaB Millboro Variant	Clayey	Favorable	3,200	Western wheatgrass	40
		Normal	2,700	Green needlegrass	35
		Unfavorable	1,900	Sideoats grama	5
				Blue grama	5
				Buffalograss	5
				Sedge	5
Oa Onita	Overflow	Favorable	4,950	Big bluestem	60
		Normal	4,500	Green needlegrass	10
		Unfavorable	3,150	Western wheatgrass	5
				Sideoats grama	5
				Little bluestem	5
				Leadplant	5
				Sedge	5

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Pt*:					
Plankinton	Closed Depression	Favorable	3,900	Western wheatgrass	85
		Normal	3,500	Sedge	10
		Unfavorable	2,500		
Prosper	Overflow	Favorable	4,700	Big bluestem	55
		Normal	4,300	Western wheatgrass	15
		Unfavorable	3,000	Green needlegrass	10
				Sideoats grama	5
				Leadplant	5
				Sedge	5
TaC Talmo	Very Shallow	Favorable	1,200	Blue grama	40
		Normal	1,000	Needleandthread	25
		Unfavorable	600	Sideoats grama	10
				Sedge	10
				Plains muhly	5
TdE*:					
Talmo	Very Shallow	Favorable	1,800	Blue grama	40
		Normal	1,500	Needleandthread	25
		Unfavorable	900	Sideoats grama	10
				Sedge	10
				Plains muhly	5
Delmont	Shallow to Gravel	Favorable	2,500	Needleandthread	60
		Normal	2,100	Sedge	10
		Unfavorable	1,300	Sideoats grama	5
				Prairie dropseed	5
				Blue grama	5
				Plains muhly	5
Te Tetonka	Wet Meadow	Favorable	4,800	Sedge	30
		Normal	4,200	Prairie cordgrass	25
		Unfavorable	2,900	Western wheatgrass	15
				Reedgrass	15
				Bluegrass	5
Wo Worthing	Shallow Marsh	Favorable	6,800	Slough sedge	35
		Normal	6,200	Rivergrass	30
		Unfavorable	5,000	Prairie cordgrass	10
				Reedgrass	10

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

[The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil]

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
AaA Alwilda	Siberian peashrub, Tatarian honeysuckle, silver buffaloberry, Peking cotoneaster, lilac.	Ponderosa pine, green ash, Siberian crabapple, common hackberry, Russian-olive, eastern redcedar.	Siberian elm	---	---
Ar. Arlo					
BaA, BaB Beadle	Peking cotoneaster, lilac.	Siberian crabapple, common chokecherry, American plum, silver buffaloberry, Siberian peashrub.	Green ash, common hackberry, ponderosa pine, Russian-olive, eastern redcedar.	---	---
BdA*:					
Beadle	Peking cotoneaster, lilac.	Siberian crabapple, common chokecherry, American plum, silver buffaloberry, Siberian peashrub.	Green ash, common hackberry, ponderosa pine, Russian-olive, eastern redcedar.	---	---
Dudley	Eastern redcedar, Rocky Mountain juniper, Siberian peashrub, silver buffaloberry, lilac.	Siberian elm, green ash, ponderosa pine, Russian-olive.	---	---	---
BeE*:					
Betts.					
Ethan.					
BnA, BnB Blendon	Silver buffaloberry, Peking cotoneaster, lilac, American plum.	Eastern redcedar, common chokecherry, Siberian peashrub.	Green ash, common hackberry, ponderosa pine, Siberian crabapple, Russian-olive.	---	---
Bo Bon	---	Common chokecherry, Siberian peashrub, American plum, lilac.	Green ash, common hackberry, Siberian crabapple, eastern redcedar.	Golden willow, ponderosa pine, blue spruce.	Eastern cottonwood.
Bx. Bon					

See footnote at end of table.

TABLE 7.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
Ca: Clamo	Lilac, American plum.	Eastern redcedar, common chokecherry, Siberian peashrub.	Golden willow, common hackberry, blue spruce, green ash, ponderosa pine, Siberian crabapple.	Eastern cottonwood	---
CbB: Clarno	Lilac	Eastern redcedar, common chokecherry, Siberian peashrub, American plum, silver buffaloberry.	Ponderosa pine, green ash, common hackberry, Russian-olive, Siberian crabapple.	Blue spruce	---
CeC*:					
Clarno	Lilac	Eastern redcedar, common chokecherry, Siberian peashrub, American plum, silver buffaloberry.	Ponderosa pine, green ash, common hackberry, Russian-olive, Siberian crabapple.	Blue spruce	---
Ethan	Tatarian honeysuckle, American plum, lilac, Peking cotoneaster.	Ponderosa pine, Russian-olive, green ash, common hackberry, Rocky Mountain juniper, eastern redcedar, Siberian peashrub.	Siberian elm	---	---
CpA*:					
Clarno	Lilac	Eastern redcedar, common chokecherry, Siberian peashrub, American plum, silver buffaloberry.	Ponderosa pine, green ash, common hackberry, Russian-olive, Siberian crabapple.	Blue spruce	---
Prosper	---	Common chokecherry, Siberian peashrub, American plum, lilac.	Green ash, common hackberry, Siberian crabapple, eastern redcedar.	Golden willow, ponderosa pine, blue spruce.	Eastern cottonwood.
DaA*:					
DeGrey	Eastern redcedar, Rocky Mountain juniper, Siberian peashrub, silver buffaloberry, lilac.	Siberian elm, green ash, ponderosa pine, Russian-olive.	---	---	---
Jerauld.					
DeA*:					
DeGrey	Eastern redcedar, Rocky Mountain juniper, Siberian peashrub, silver buffaloberry, lilac.	Siberian elm, green ash, ponderosa pine, Russian-olive.	---	---	---

See footnote at end of table.

TABLE 7.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
DeA*:					
Onita	---	Common chokecherry, Siberian peashrub, American plum, lilac.	Green ash, common hackberry, Siberian crabapple, eastern redcedar.	Golden willow, ponderosa pine, blue spruce.	Eastern cottonwood.
DmA*, DmB*:					
Delmont	Siberian peashrub, Tatarian honeysuckle, silver buffaloberry, Peking cotoneaster, lilac.	Ponderosa pine, green ash, Siberian crabapple, common hackberry, Russian-olive, eastern redcedar.	Siberian elm	---	---
Enet	Siberian peashrub, Tatarian honeysuckle, silver buffaloberry, Peking cotoneaster, lilac.	Ponderosa pine, green ash, Siberian crabapple, common hackberry, Russian-olive, eastern redcedar.	Siberian elm	---	---
DnC*:					
Delmont	Siberian peashrub, Tatarian honeysuckle, silver buffaloberry, Peking cotoneaster, lilac.	Ponderosa pine, green ash, Siberian crabapple, common hackberry, Russian-olive, eastern redcedar.	Siberian elm	---	---
Talmo.					
Do Dimo	---	Common chokecherry, Siberian peashrub, American plum, lilac.	Green ash, common hackberry, Siberian crabapple, eastern redcedar.	Golden willow, ponderosa pine, blue spruce.	Eastern cottonwood.
DsA*:					
Dudley	Eastern redcedar, Rocky Mountain juniper, Siberian peashrub, silver buffaloberry, lilac.	Siberian elm, green ash, ponderosa pine, Russian-olive.	---	---	---
Jerauld.					
Du. Durrstein					
EdA*:					
Eakin	Lilac	Eastern redcedar, common chokecherry, Siberian peashrub, American plum, silver buffaloberry.	Ponderosa pine, green ash, common hackberry, Russian-olive, Siberian crabapple.	Blue spruce	---

See footnote at end of table.

TABLE 7.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
EdA*:					
DeGrey	Eastern redcedar, Rocky Mountain juniper, Siberian peashrub, silver buffaloberry, lilac.	Siberian elm, green ash, ponderosa pine, Russian-olive.	---	---	---
EeB*:					
Eakin	Lilac	Eastern redcedar, common chokecherry, Siberian peashrub, American plum, silver buffaloberry.	Ponderosa pine, green ash, common hackberry, Russian-olive, Siberian crabapple.	Blue spruce	---
Ethan	Tatarian honeysuckle, American plum, lilac, Peking cotoneaster.	Ponderosa pine, Russian-olive, green ash, common hackberry, Rocky Mountain juniper, eastern redcedar, Siberian peashrub.	Siberian elm	---	---
EnA Enet	Siberian peashrub, Tatarian honeysuckle, silver buffaloberry, Peking cotoneaster, lilac.	Ponderosa pine, green ash, Siberian crabapple, common hackberry, Russian-olive, eastern redcedar.	Siberian elm	---	---
EtD*:					
Ethan.					
Betts.					
HbA*:					
Highmore	Lilac	Eastern redcedar, common chokecherry, Siberian peashrub, American plum, silver buffaloberry.	Ponderosa pine, green ash, common hackberry, Russian-olive, Siberian crabapple.	Blue spruce	---
Onita	---	Common chokecherry, Siberian peashrub, American plum, lilac.	Green ash, common hackberry, Siberian crabapple, eastern redcedar.	Golden willow, ponderosa pine, blue spruce.	Eastern cottonwood.
HdA*, HdB*:					
Houdek	Lilac	Eastern redcedar, common chokecherry, Siberian peashrub, American plum, silver buffaloberry.	Ponderosa pine, green ash, common hackberry, Russian-olive, Siberian crabapple.	Blue spruce	---

See footnote at end of table.

TABLE 7.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
HdA*, HdB*:					
Dudley	Eastern redcedar, Rocky Mountain juniper, Siberian peashrub, silver buffaloberry, lilac.	Siberian elm, green ash, ponderosa pine, Russian-olive.	---	---	---
HeB*, HeC*:					
Houdek	Lilac	Eastern redcedar, common chokecherry, Siberian peashrub, American plum, silver buffaloberry.	Ponderosa pine, green ash, common hackberry, Russian-olive, Siberian crabapple.	Blue spruce	---
Ethan	Tatarian honeysuckle, American plum, lilac, Peking cotoneaster.	Ponderosa pine, Russian-olive, green ash, common hackberry, Rocky Mountain juniper, eastern redcedar, Siberian peashrub.	Siberian elm	---	---
HhA*, HhB*:					
Houdek	Lilac	Eastern redcedar, common chokecherry, Siberian peashrub, American plum, silver buffaloberry.	Ponderosa pine, green ash, common hackberry, Russian-olive, Siberian crabapple.	Blue spruce	---
Hoven.					
HoB*:					
Houdek	Lilac	Eastern redcedar, common chokecherry, Siberian peashrub, American plum, silver buffaloberry.	Ponderosa pine, green ash, common hackberry, Russian-olive, Siberian crabapple.	Blue spruce	---
Plankinton.					
HpA*:					
Houdek	Lilac	Eastern redcedar, common chokecherry, Siberian peashrub, American plum, silver buffaloberry.	Ponderosa pine, green ash, common hackberry, Russian-olive, Siberian crabapple.	Blue spruce	---
Prosper	---	Common chokecherry, Siberian peashrub, American plum, lilac.	Green ash, common hackberry, Siberian crabapple, eastern redcedar.	Golden willow, ponderosa pine, blue spruce.	Eastern cottonwood.
Hv. Hoven					

See footnote at end of table.

TABLE 7.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
Hw*: Hoven.					
Plankinton.					
La Lane	Lilac	Eastern redcedar, common chokecherry, Siberian peashrub, American plum, silver buffaloberry.	Ponderosa pine, green ash, common hackberry, Russian-olive, Siberian crabapple.	Blue spruce	---
MaA, MaB Millboro Variant	Peking cotoneaster, lilac.	Siberian crabapple, common chokecherry, American plum, silver buffaloberry, Siberian peashrub.	Green ash, common hackberry, ponderosa pine, Russian-olive, eastern redcedar.	---	---
Oa Onita	---	Common chokecherry, Siberian peashrub, American plum, lilac.	Green ash, common hackberry, Siberian crabapple, eastern redcedar.	Golden willow, ponderosa pine, blue spruce.	Eastern cottonwood.
Pg*. Pits					
Pt*: Plankinton.					
Prosper	---	Common chokecherry, Siberian peashrub, American plum lilac.	Green ash, common hackberry, Siberian crabapple, eastern redcedar.	Golden willow, ponderosa pine, blue spruce.	Eastern cottonwood.
TaC. Talmo					
TdE*: Talmo.					
Delmont.					
Te. Tetonka					
Wo. Worthing					
Wp. Worthing					

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements						Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Wetland plants	Shallow water areas	Openland wildlife	Wetland wildlife	Rangeland wildlife
AaA Alwilda	Fair	Fair	Good	Fair	Very poor	Very poor	Fair	Very poor	Good.
Ar Arlo	Very poor	Poor	Fair	Good	Fair	Fair	Very poor	Fair	Fair.
BaA Beadle	Good	Fair	Good	Fair	Very poor	Very poor	Good	Very poor	Good.
BaB Beadle	Fair	Fair	Good	Fair	Very poor	Very poor	Fair	Very poor	Good.
BdA*:									
Beadle	Good	Fair	Good	Fair	Very poor	Very poor	Good	Very poor	Good.
Dudley	Poor	Poor	Poor	Poor	Very poor	Very poor	Poor	Very poor	Poor.
BeE*:									
Betts	Very poor	Very poor	Fair	Poor	Very poor	Very poor	Very poor	Very poor	Fair.
Ethan	Very poor	Fair	Good	Poor	Very poor	Very poor	Very poor	Very poor	Good.
BnA, BnB Blendon	Fair	Fair	Good	Fair	Very poor	Very poor	Fair	Very poor	Good.
Bo Bon	Good	Good	Fair	Good	Very poor	Very poor	Poor	Very poor	Fair.
Bx Bon	Very poor	Good	Fair	Poor	Very poor	Very poor	Poor	Very poor	Fair.
Ca Clamo	Good	Good	Fair	Good	Fair	Fair	Good	Fair	Fair.
CbB Clarno	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
CeC*:									
Clarno	Fair	Good	Good	Fair	Very poor	Very poor	Fair	Very poor	Good.
Ethan	Poor	Fair	Good	Poor	Very poor	Very poor	Poor	Very poor	Good.
CpA*:									
Clarno	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
Prosper	Good	Good	Fair	Good	Very poor	Very poor	Good	Very poor	Fair.
DaA*:									
DeGrey	Poor	Fair	Fair	Poor	Very poor	Very poor	Poor	Very poor	Fair.
Jerauld	Very poor	Poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor.
DeA*:									
DeGrey	Poor	Fair	Fair	Poor	Very poor	Very poor	Poor	Very poor	Fair.
Onita	Good	Good	Fair	Good	Very poor	Very poor	Good	Very poor	Fair.
DmA*, DmB*:									
Delmont	Poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Very poor	Poor.
Enet	Fair	Fair	Good	Poor	Very poor	Very poor	Fair	Very poor	Good.

See footnote at end of table.

TABLE 8.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements						Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Wetland plants	Shallow water areas	Openland wildlife	Wetland wildlife	Rangeland wildlife
DnC*:									
Delmont-----------	Very poor	Fair	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor.
Talmo-------------	Very poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor.
Do----------------- Dimo	Fair	Good	Fair	Good	Very poor	Very poor	Good	Very poor	Fair.
DsA*:									
Dudley------------	Poor	Poor	Poor	Poor	Very poor	Very poor	Poor	Very poor	Poor.
Jerauld-----------	Very poor	Poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor.
Du----------------- Durrstein	Very poor	Poor	Fair	Poor	Poor	Fair	Very poor	Poor	Fair.
EdA*:									
Eakin-------------	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
DeGrey------------	Poor	Fair	Fair	Poor	Very poor	Very poor	Poor	Very poor	Fair.
EeB*:									
Eakin-------------	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
Ethan-------------	Fair	Fair	Good	Poor	Very poor	Very poor	Fair	Very poor	Good.
EnA---------------- Enet	Fair	Fair	Good	Poor	Very poor	Very poor	Fair	Very poor	Good.
EtD*:									
Ethan-------------	Very poor	Fair	Good	Poor	Very poor	Very poor	Very poor	Very poor	Good.
Betts-------------	Very poor	Poor	Fair	Poor	Very poor	Very poor	Very poor	Very poor	Fair.
HbA*:									
Highmore----------	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
Onita-------------	Good	Good	Fair	Good	Very poor	Very poor	Good	Very poor	Fair.
HdA*, HdB*:									
Houdek------------	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
Dudley------------	Poor	Poor	Poor	Poor	Very poor	Very poor	Poor	Very poor	Poor.
HeB*:									
Houdek------------	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
Ethan-------------	Fair	Fair	Good	Poor	Very poor	Very poor	Fair	Very poor	Good.
HeC*:									
Houdek------------	Fair	Good	Good	Fair	Very poor	Very poor	Fair	Very poor	Good.
Ethan-------------	Poor	Fair	Good	Poor	Very poor	Very poor	Poor	Very poor	Good.
HhA*, HhB*:									
Houdek------------	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
Hoven-------------	Very poor	Poor	Poor	Poor	Fair	Fair	Very poor	Fair	Poor.
HoB*:									
Houdek------------	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
Plankinton--------	Poor	Fair	Poor	Poor	Fair	Fair	Poor	Fair	Poor.
HpA*:									
Houdek------------	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.

See footnote at end of table.

TABLE 8.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements						Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Wetland plants	Shallow water areas	Openland wildlife	Wetland wildlife	Rangeland wildlife
HpA*:									
Prosper-----------	Good	Good	Fair	Good	Very poor	Very poor	Good	Very poor	Fair.
Hv----------------- Hoven	Very poor	Poor	Poor	Poor	Fair	Fair	Very poor	Fair	Poor.
Hw*:									
Hoven-------------	Very poor	Poor	Poor	Poor	Fair	Fair	Very poor	Fair	Poor.
Plankinton--------	Poor	Fair	Poor	Poor	Fair	Fair	Poor	Fair	Poor.
La----------------- Lane	Good	Fair	Good	Good	Very poor	Very poor	Good	Very poor	Good.
MaA, MaB----------- Millboro Variant	Fair	Fair	Good	Fair	Very poor	Very poor	Fair	Very poor	Good.
Oa----------------- Onita	Good	Good	Fair	Good	Very poor	Very poor	Good	Very poor	Fair.
Pg*. Pits									
Pt*:									
Plankinton--------	Poor	Fair	Poor	Poor	Fair	Fair	Poor	Fair	Poor.
Prosper-----------	Good	Good	Fair	Good	Very poor	Very poor	Good	Very poor	Fair.
TaC---------------- Talmo	Very poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor.
TdE*:									
Talmo-------------	Very poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor.
Delmont-----------	Very poor	Fair	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor.
Te----------------- Tetonka	Poor	Poor	Fair	Poor	Fair	Fair	Poor	Fair	Fair.
Wo----------------- Worthing	Very poor	Poor	Fair	Poor	Good	Good	Very poor	Good	Fair.
Wp----------------- Worthing	Very poor	Very poor	Very poor	Very poor	Good	Good	Very poor	Good	Very poor.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
AaA Alwilda	Severe: cutbanks cave.	Slight	Slight	Slight	Slight.
Ar Arlo	Severe: cutbanks cave, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: wetness, floods, frost action.
BaA, BaB Beadle	Moderate: too clayey.	Severe: shrink-swell.	Moderate: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
BdA*:					
Beadle	Moderate: too clayey.	Severe: shrink-swell.	Moderate: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Dudley	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
BeE*:					
Betts	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.
Ethan	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.
BnA Blendon	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.
BnB Blendon	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.
Bo Bon	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Bx Bon	Severe: wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: floods, frost action.
Ca Clamo	Severe: wetness.	Severe: floods, shrink-swell, wetness.	Severe: floods, shrink-swell, wetness.	Severe: floods, shrink-swell, wetness.	Severe: low strength, wetness, floods.
CbB Clarno	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Severe: low strength.
CeC*:					
Clarno	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Severe: low strength.
Ethan	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Severe: low strength.
CpA*:					
Clarno	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
CpA*:					
Prosper	Moderate: wetness, floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: low strength, floods, frost action.
DaA*:					
DeGrey	Moderate: too clayey.	Severe: shrink-swell.	Moderate: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
Jerauld	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
DeA*:					
DeGrey	Moderate: too clayey.	Severe: shrink-swell.	Moderate: shrink-swell.	Severe: shrink-swell.	Severe: low strength. shrink-swell.
Onita	Moderate: too clayey, wetness, floods.	Severe: floods, shrink-swell.	Severe: floods.	Severe: floods, shrink-swell.	Severe: low strength, floods, frost action.
DmA*:					
Delmont	Severe: cutbanks cave.	Slight	Slight	Slight	Slight.
Enet	Severe: cutbanks cave.	Slight	Slight	Slight	Slight.
DmB*:					
Delmont	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
Enet	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
DnC*:					
Delmont	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
Talmo	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
Do Dimo	Severe: cutbanks cave, wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: low strength, floods, frost action.
DsA*:					
Dudley	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
Jerauld	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Du Durrstein	Severe: wetness.	Severe: floods, shrink-swell, wetness.	Severe: floods, shrink-swell, wetness.	Severe: floods, shrink-swell, wetness.	Severe: floods, low strength, wetness.
EdA*:					
Eakin	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
EdA*:					
DeGrey	Moderate: too clayey.	Severe: shrink-swell.	Moderate: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
EeB*:					
Eakin	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Severe: low strength.
Ethan	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Severe: low strength.
EnA Enet	Severe: cutbanks cave.	Slight	Slight	Slight	Slight.
EtD*:					
Ethan	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, slope.	Severe: slope.	Severe: low strength.
Betts	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, slope.	Severe: slope.	Severe: low strength.
HbA*:					
Highmore	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
Onita	Moderate: too clayey, wetness, floods.	Severe: floods, shrink-swell.	Severe: floods.	Severe: floods, shrink-swell.	Severe: low strength, floods, frost action.
HdA*:					
Houdek	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
Dudley	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
HdB*:					
Houdek	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
Dudley	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
HeB*:					
Houdek	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
Ethan	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Severe: low strength.
HeC*:					
Houdek	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.
Ethan	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Severe: low strength.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
HhA*: Houdek	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
Hoven	Severe: ponding.	Severe: shrink-swell, ponding.	Severe: shrink-swell, ponding.	Severe: shrink-swell, ponding.	Severe: ponding, low strength.
HhB*: Houdek	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
Hoven	Severe: ponding.	Severe: shrink-swell, ponding.	Severe: shrink-swell, ponding.	Severe: shrink-swell, ponding.	Severe: ponding, low strength.
HoB*: Houdek	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
Plankinton	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.
HpA*: Houdek	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
Prosper	Moderate: wetness, floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: low strength, floods, frost action.
Hv Hoven	Severe: ponding.	Severe: shrink-swell, ponding.	Severe: shrink-swell, ponding.	Severe: shrink-swell, ponding.	Severe: ponding, low strength.
Hw*: Hoven	Severe: ponding.	Severe: shrink-swell, ponding.	Severe: shrink-swell, ponding.	Severe: shrink-swell, ponding.	Severe: ponding, low strength.
Plankinton	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.
La Lane	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
MaA, MaB Millboro Variant	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
Oa Onita	Moderate: too clayey, wetness, floods.	Severe: floods, shrink-swell.	Severe: floods.	Severe: floods, shrink-swell.	Severe: low strength, floods, frost action.
Pg*. Pits					
Pt*: Plankinton	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Pt*:					
Prosper----------	Moderate: wetness, floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: low strength, floods, frost action.
TaC--------------- Talmo	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
TdE*:					
Talmo------------	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Delmont----------	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Te---------------- Tetonka	Severe: ponding.	Severe: floods, ponding, shrink-swell.	Severe: floods, shrink-swell, ponding.	Severe: floods, ponding, shrink-swell.	Severe: floods, low strength, ponding.
Wo---------------- Worthing	Severe: ponding.	Severe: shrink-swell, ponding.	Severe: shrink-swell, ponding.	Severe: shrink-swell, ponding.	Severe: low strength, ponding, frost action.
Wp---------------- Worthing	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, frost action.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
AaA Alwilda	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Ar Arlo	Severe: floods, wetness, poor filter.	Severe: seepage, floods, wetness.	Severe: floods, seepage, wetness.	Severe: floods, seepage, wetness.	Poor: too sandy, small stones, wetness.
BaA Beadle	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
BaB Beadle	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
BdA*:					
Beadle	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Dudley	Severe: percs slowly.	Slight	Severe: excess sodium.	Slight	Poor: hard to pack, excess sodium.
BeE*:					
Betts	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Ethan	Severe: slope, percs slowly.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
BnA, BnB Blendon	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: seepage.
Bo Bon	Severe: floods.	Severe: floods, seepage.	Severe: floods, seepage.	Severe: floods.	Good.
Bx Bon	Severe: floods, wetness.	Severe: seepage, floods, wetness.	Severe: floods, seepage, wetness.	Severe: floods, wetness.	Fair: wetness.
Ca Clamo	Severe: floods, percs slowly, wetness.	Severe: floods, wetness.	Severe: floods, wetness, too clayey.	Severe: floods, wetness.	Poor: too clayey, wetness, hard to pack.
CbB Clarno	Severe: percs slowly.	Moderate: slope, seepage.	Slight	Slight	Good.
CeC*:					
Clarno	Severe: percs slowly.	Severe: slope.	Slight	Slight	Good.
Ethan	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Good.

See footnote at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
CpA*:					
Clarno	Severe: percs slowly.	Moderate: seepage.	Slight	Slight	Good.
Prosper	Severe: floods, wetness, percs slowly.	Slight	Severe: floods.	Severe: floods.	Fair: too clayey, wetness.
DaA*:					
DeGrey	Severe: percs slowly.	Slight	Severe: excess sodium.	Slight	Poor: hard to pack, excess sodium.
Jerauld	Severe: percs slowly.	Slight	Severe: too clayey, excess sodium.	Slight	Poor: too clayey, hard to pack, excess sodium.
DeA*:					
DeGrey	Severe: percs slowly.	Slight	Severe: excess sodium.	Slight	Poor: hard to pack, excess sodium.
Onita	Severe: floods, wetness, percs slowly.	Moderate: wetness.	Severe: floods.	Severe: floods.	Fair: too clayey.
DmA*, DmB*:					
Delmont	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: small stones, seepage, too sandy.
Enet	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
DnC*:					
Delmont	Severe: poor filter.	Severe: slope, seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: small stones, seepage, too sandy.
Talmo	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Do Dimo	Severe: floods, wetness, poor filter.	Severe: seepage, wetness, floods.	Severe: floods, seepage, wetness.	Severe: floods, seepage, wetness.	Poor: too sandy, seepage, small stones.
DsA*:					
Dudley	Severe: percs slowly.	Slight	Severe: excess sodium.	Slight	Poor: hard to pack, excess sodium.
Jerauld	Severe: percs slowly.	Slight	Severe: too clayey, excess sodium.	Slight	Poor: too clayey, hard to pack, excess sodium.

See footnote at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Du------------------ Durrstein	Severe: floods, percs slowly, wetness.	Severe: floods.	Severe: floods, too clayey, wetness.	Severe: floods, wetness.	Poor: too clayey, hard to pack, wetness.
EdA*:					
Eakin--------------	Severe: percs slowly.	Slight-----------	Moderate: too clayey.	Slight-----------	Fair: too clayey.
DeGrey-------------	Severe: percs slowly.	Slight-----------	Severe: excess sodium.	Slight-----------	Poor: hard to pack, excess sodium.
EeB*:					
Eakin--------------	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
Ethan--------------	Severe: percs slowly.	Moderate: slope, seepage.	Moderate: too clayey.	Slight-----------	Good.
EnA----------------- Enet	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
EtD*:					
Ethan--------------	Severe: percs slowly.	Severe: slope.	Moderate: too clayey, slope.	Moderate: slope.	Fair: slope.
Betts--------------	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
HbA*:					
Highmore-----------	Severe: percs slowly.	Moderate: seepage.	Slight-----------	Slight-----------	Good.
Onita--------------	Severe: floods, wetness, percs slowly.	Moderate: wetness.	Severe: floods.	Severe: floods.	Fair: too clayey.
HdA*:					
Houdek-------------	Severe: percs slowly.	Slight-----------	Moderate: too clayey.	Slight-----------	Fair: too clayey.
Dudley-------------	Severe: percs slowly.	Slight-----------	Severe: excess sodium.	Slight-----------	Poor: hard to pack, excess sodium.
HdB*:					
Houdek-------------	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
Dudley-------------	Severe: percs slowly.	Moderate: slope.	Severe: excess sodium.	Slight-----------	Poor: hard to pack, excess sodium.
HeB*:					
Houdek-------------	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
Ethan--------------	Severe: percs slowly.	Moderate: slope, seepage.	Moderate: too clayey.	Slight-----------	Good.

See footnote at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
HeC*:					
Houdek	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Ethan	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Good.
HhA*:					
Houdek	Severe: percs slowly.	Slight	Moderate: too clayey.	Slight	Fair: too clayey.
Hoven	Severe: percs slowly, ponding.	Slight	Severe: too clayey, ponding.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
HhB*:					
Houdek	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Hoven	Severe: percs slowly, ponding.	Slight	Severe: too clayey, ponding.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
HoB*:					
Houdek	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Plankinton	Severe: ponding, percs slowly.	Slight	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
HpA*:					
Houdek	Severe: percs slowly.	Slight	Moderate: too clayey.	Slight	Fair: too clayey.
Prosper	Severe: floods, wetness, percs slowly.	Slight	Severe: floods.	Severe: floods.	Fair: too clayey, wetness.
Hv Hoven	Severe: percs slowly, ponding.	Slight	Severe: too clayey, ponding.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
Hw*:					
Hoven	Severe: percs slowly, ponding.	Slight	Severe: too clayey, ponding.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
Plankinton	Severe: ponding, percs slowly.	Slight	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
La Lane	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
MaA Millboro Variant	Severe: percs slowly.	Moderate: depth to rock.	Severe: depth to rock, too clayey.	Moderate: depth to rock.	Poor: too clayey, hard to pack.

See footnote at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
MaB----------------- Millboro Variant	Severe: percs slowly.	Moderate: depth to rock, slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock.	Poor: too clayey, hard to pack.
Oa------------------ Onita	Severe: floods, wetness, percs slowly.	Moderate: wetness.	Severe: floods.	Severe: floods.	Fair: too clayey.
Pg*. Pits					
Pt*: Plankinton----------	Severe: ponding, percs slowly.	Slight-----------	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
Prosper------------	Severe: floods, wetness, percs slowly.	Slight-----------	Severe: floods.	Severe: floods.	Fair: too clayey, wetness.
TaC----------------- Talmo	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
TdE*: Talmo--------------	Severe: slope, poor filter.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
Delmont------------	Severe: slope, poor filter.	Severe: slope, seepage.	Severe: seepage, slope, too sandy.	Severe: slope, seepage.	Poor: small stones, seepage, too sandy.
Te------------------ Tetonka	Severe: percs slowly, ponding.	Slight-----------	Severe: ponding, too clayey.	Severe: ponding.	Poor: ponding, too clayey, hard to pack.
Wo------------------ Worthing	Severe: percs slowly, ponding.	Slight-----------	Severe: too clayey, ponding.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
Wp------------------ Worthing	Severe: percs slowly, ponding.	Severe: ponding.	Severe: too clayey, ponding.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
AaA Alwilda	Good	Probable	Probable	Poor: area reclaim.
Ar Arlo	Poor: wetness.	Probable	Probable	Poor: area reclaim, wetness.
BaA, BaB Beadle	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
BdA*:				
Beadle	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Dudley	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
BeE*:				
Betts	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Ethan	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
BnA, BnB Blendon	Good	Probable	Improbable: too sandy.	Fair: thin layer.
Bo Bon	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Bx Bon	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Ca Clamo	Poor: wetness, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
CbB Clarno	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
CeC*:				
Clarno	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Ethan	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
CpA*:				
Clarno	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Prosper	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
DaA*:				
DeGrey	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
DaA*:				
Jerauld	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
DeA*:				
DeGrey	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
Onita	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
DmA*, DmB*:				
Delmont	Good	Probable	Probable	Poor: small stones, area reclaim.
Enet	Good	Probable	Probable	Poor: small stones, area reclaim.
DnC*:				
Delmont	Good	Probable	Probable	Poor: small stones, area reclaim.
Talmo	Good	Probable	Probable	Poor: small stones, area reclaim.
Do Dimo	Fair: wetness.	Probable	Probable	Fair: thin layer, area reclaim.
DsA*:				
Dudley	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
Jerauld	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
Du Durrstein	Poor: low strength, shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt, wetness, excess sodium.
EdA*:				
Eakin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
DeGrey	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
EeB*:				
Eakin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
Ethan	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
EnA Enet	Good	Probable	Probable	Poor: small stones, area reclaim.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
EtD*:				
Ethan	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, small stones.
Betts	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, small stones.
HbA*:				
Highmore	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Onita	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
HdA*, HdB*:				
Houdek	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Dudley	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
HeB*:				
Houdek	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Ethan	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
HeC*:				
Houdek	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, small stones.
Ethan	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
HhA*, HhB*:				
Houdek	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Hoven	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, excess sodium.
HoB*:				
Houdek	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Plankinton	Poor: low strength, shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
HpA*:				
Houdek	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Prosper	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Hv Hoven	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, excess sodium.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Hw*:				
Hoven	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, excess sodium.
Plankinton	Poor: low strength, shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
La Lane	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
MaA, MaB Millboro Variant	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Oa Onita	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Pg*. Pits				
Pt*:				
Plankinton	Poor: low strength, shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
Prosper	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
TaC Talmo	Good	Probable	Probable	Poor: small stones, area reclaim.
TdE*:				
Talmo	Poor: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
Delmont	Fair: slope.	Probable	Probable	Poor: small stones, slope, area reclaim.
Te Tetonka	Poor: low strength, shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, thin layer.
Wo Worthing	Poor: low strength, shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Wp Worthing	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
AaA Alwilda	Severe: seepage.	Severe: seepage.	Deep to water	Droughty	Too sandy	Droughty.
Ar Arlo	Severe: seepage.	Severe: wetness.	Floods, frost action, cutbanks cave.	Wetness, rooting depth, floods.	Wetness, too sandy.	Wetness, rooting depth.
BaA Beadle	Slight	Moderate: hard to pack.	Deep to water	Percs slowly	Erodes easily	Erodes easily, percs slowly.
BaB Beadle	Moderate: slope.	Moderate: hard to pack.	Deep to water	Slope, percs slowly.	Erodes easily	Erodes easily, percs slowly.
BdA*:						
Beadle	Slight	Moderate: hard to pack.	Deep to water	Percs slowly	Erodes easily	Erodes easily, percs slowly.
Dudley	Slight	Severe: excess sodium.	Deep to water	Percs slowly, excess sodium.	Percs slowly, erodes easily.	Excess sodium, percs slowly, erodes easily.
BeE*:						
Betts	Severe: slope.	Slight	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
Ethan	Severe: slope.	Slight	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
BnA Blendon	Severe: seepage.	Severe: seepage, piping.	Deep to water	Soil blowing	Too sandy, soil blowing.	Favorable.
BnB Blendon	Severe: seepage.	Severe: seepage, piping.	Deep to water	Soil blowing, slope.	Too sandy, soil blowing.	Favorable.
Bo Bon	Moderate: seepage.	Moderate: piping.	Deep to water	Floods	Favorable	Favorable.
Bx Bon	Moderate: seepage.	Moderate: piping.	Floods, frost action.	Wetness, floods.	Wetness	Favorable.
Ca Clamo	Slight	Severe: wetness, hard to pack.	Percs slowly, frost action, floods.	Percs slowly, wetness.	Percs slowly, wetness.	Wetness, percs slowly.
CbB Clarno	Moderate: seepage, slope.	Slight	Deep to water	Slope	Erodes easily	Erodes easily.
CeC*:						
Clarno	Moderate: seepage, slope.	Slight	Deep to water	Slope	Erodes easily	Erodes easily.
Ethan	Moderate: seepage, slope.	Slight	Deep to water	Slope	Erodes easily	Erodes easily.
CpA*:						
Clarno	Moderate: seepage.	Slight	Deep to water	Favorable	Erodes easily	Erodes easily.
Prosper	Slight	Slight	Deep to water	Floods	Erodes easily	Erodes easily.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
DaA*:						
DeGrey	Slight	Severe: hard to pack, excess sodium.	Deep to water	Percs slowly, excess sodium.	Erodes easily	Excess sodium, erodes easily, percs slowly.
Jerauld	Slight	Severe: hard to pack, excess sodium.	Deep to water	Percs slowly, excess sodium.	Percs slowly, erodes easily.	Excess sodium, droughty, erodes easily.
DeA*:						
DeGrey	Slight	Severe: hard to pack, excess sodium.	Deep to water	Percs slowly, excess sodium.	Erodes easily	Excess sodium, erodes easily, percs slowly.
Onita	Slight	Moderate: hard to pack.	Floods, frost action.	Wetness, floods.	Erodes easily	Erodes easily.
DmA*:						
Delmont	Severe: seepage.	Severe: seepage.	Deep to water	Droughty	Too sandy	Droughty.
Enet	Severe: seepage.	Severe: seepage.	Deep to water	Favorable	Too sandy	Favorable.
DmB*:						
Delmont	Severe: seepage.	Severe: seepage.	Deep to water	Droughty, slope.	Too sandy	Droughty.
Enet	Severe: seepage.	Severe: seepage.	Deep to water	Slope	Too sandy	Favorable.
DnC*:						
Delmont	Severe: seepage.	Severe: seepage.	Deep to water	Droughty, slope.	Too sandy	Droughty.
Talmo	Severe: seepage, slope.	Severe: seepage.	Deep to water	Droughty, rooting depth.	Slope, too sandy.	Slope, droughty, rooting depth.
Do Dimo	Severe: seepage.	Severe: seepage.	Floods, frost action, cutbanks cave.	Wetness, floods.	Wetness, too sandy.	Favorable.
DsA*:						
Dudley	Slight	Severe: excess sodium.	Deep to water	Percs slowly, excess sodium.	Percs slowly, erodes easily.	Excess sodium, percs slowly, erodes easily.
Jerauld	Slight	Severe: hard to pack, excess sodium.	Deep to water	Percs slowly, excess sodium.	Percs slowly, erodes easily.	Excess sodium, droughty, erodes easily.
Du Durrstein	Slight	Severe: hard to pack, wetness, excess sodium.	Floods, percs slowly, excess salt.	Wetness, droughty, percs slowly.	Wetness, percs slowly, erodes easily.	Excess sodium, excess salt, wetness.
EdA*:						
Eakin	Moderate: seepage.	Moderate: hard to pack.	Deep to water	Favorable	Erodes easily	Erodes easily.
DeGrey	Slight	Severe: hard to pack, excess sodium.	Deep to water	Percs slowly, excess sodium.	Erodes easily	Excess sodium, erodes easily, percs slowly.
EeB*:						
Eakin	Moderate: seepage, slope.	Moderate: hard to pack.	Deep to water	Slope	Erodes easily	Erodes easily.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
EeB*:						
Ethan	Moderate: seepage, slope.	Slight	Deep to water	Slope	Erodes easily	Erodes easily.
EnA Enet	Severe: seepage.	Severe: seepage.	Deep to water	Favorable	Too sandy	Favorable.
EtD*:						
Ethan	Severe: slope.	Slight	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Betts	Severe: slope.	Slight	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
HbA*:						
Highmore	Moderate: seepage.	Moderate: thin layer, piping.	Deep to water	Favorable	Erodes easily	Erodes easily.
Onita	Slight	Moderate: hard to pack.	Floods, frost action.	Wetness, floods.	Erodes easily	Erodes easily.
HdA*:						
Houdek	Slight	Slight	Deep to water	Favorable	Erodes easily	Erodes easily.
Dudley	Slight	Severe: excess sodium.	Deep to water	Percs slowly, excess sodium.	Percs slowly, erodes easily.	Excess sodium, percs slowly, erodes easily.
HdB*:						
Houdek	Moderate: slope.	Slight	Deep to water	Slope	Erodes easily	Erodes easily.
Dudley	Moderate: slope.	Severe: excess sodium.	Deep to water	Percs slowly, slope, excess sodium.	Percs slowly, erodes easily.	Excess sodium, percs slowly, erodes easily.
HeB*:						
Houdek	Moderate: slope.	Slight	Deep to water	Slope	Erodes easily	Erodes easily.
Ethan	Moderate: seepage, slope.	Slight	Deep to water	Slope	Erodes easily	Erodes easily.
HeC*:						
Houdek	Severe: slope.	Slight	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Ethan	Moderate: seepage, slope.	Slight	Deep to water	Slope	Erodes easily	Erodes easily.
HhA*:						
Houdek	Slight	Slight	Deep to water	Favorable	Erodes easily	Erodes easily.
Hoven	Slight	Severe: hard to pack, ponding, excess sodium.	Percs slowly, ponding, excess salt.	Ponding, percs slowly, excess sodium.	Wetness, percs slowly, erodes easily.	Percs slowly, wetness, excess sodium.
HhB*:						
Houdek	Moderate: slope.	Slight	Deep to water	Slope	Erodes easily	Erodes easily.
Hoven	Slight	Severe: hard to pack, ponding, excess sodium.	Percs slowly, ponding, excess salt.	Ponding, percs slowly, excess sodium.	Wetness, percs slowly, erodes easily.	Percs slowly, wetness, excess sodium.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
HoB*:						
Houdek	Moderate: slope.	Slight	Deep to water	Slope	Erodes easily	Erodes easily.
Plankinton	Slight	Severe: ponding.	Ponding, percs slowly.	Ponding, percs slowly.	Ponding, percs slowly.	Wetness, percs slowly.
HpA*:						
Houdek	Slight	Slight	Deep to water	Favorable	Erodes easily	Erodes easily.
Prosper	Slight	Slight	Deep to water	Floods	Erodes easily	Erodes easily.
Hv Hoven	Slight	Severe: hard to pack, ponding, excess sodium.	Percs slowly, ponding, excess salt.	Ponding, percs slowly, excess sodium.	Wetness, percs slowly, erodes easily.	Percs slowly, wetness, excess sodium.
Hw*:						
Hoven	Slight	Severe: hard to pack, ponding, excess sodium.	Percs slowly, ponding, excess salt.	Ponding, percs slowly, excess sodium.	Wetness, percs slowly, erodes easily.	Percs slowly, wetness, excess sodium.
Plankinton	Slight	Severe: ponding.	Ponding, percs slowly.	Ponding, percs slowly.	Ponding, percs slowly.	Wetness, percs slowly.
La Lane	Slight	Moderate: hard to pack.	Deep to water	Percs slowly	Erodes easily, percs slowly.	Erodes easily, percs slowly.
MaA Millboro Variant	Moderate: depth to rock.	Severe: hard to pack.	Deep to water	Slow intake, percs slowly.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
MaB Millboro Variant	Moderate: depth to rock, slope.	Severe: hard to pack.	Deep to water	Slow intake, percs slowly.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Oa Onita	Slight	Moderate: hard to pack.	Floods, frost action.	Wetness, floods.	Erodes easily	Erodes easily.
Pg*. Pits						
Pt*:						
Plankinton	Slight	Severe: ponding.	Ponding, percs slowly.	Ponding, percs slowly.	Ponding, percs slowly.	Wetness, percs slowly.
Prosper	Slight	Slight	Deep to water	Floods	Erodes easily	Erodes easily.
TaC Talmo	Severe: seepage, slope.	Severe: seepage.	Deep to water	Droughty, rooting depth.	Slope, too sandy.	Slope, droughty, rooting depth.
TdE*:						
Talmo	Severe: seepage, slope.	Severe: seepage.	Deep to water	Droughty, rooting depth.	Slope, too sandy.	Slope, droughty, rooting depth.
Delmont	Severe: seepage, slope.	Severe: seepage.	Deep to water	Droughty, slope.	Slope, too sandy.	Droughty, slope.
Te Tetonka	Slight	Severe: ponding, hard to pack.	Percs slowly, ponding.	Percs slowly, ponding.	Ponding, percs slowly.	Wetness, percs slowly.
Wo Worthing	Slight	Severe: hard to pack, ponding.	Ponding, frost action, percs slowly.	Ponding, percs slowly.	Ponding, percs slowly, erodes easily.	Wetness, percs slowly.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Wp----------------- Worthing	Slight----------	Severe: hard to pack, ponding.	Percs slowly, ponding, frost action.	Ponding, percs slowly.	Ponding, percs slowly.	Wetness, percs slowly.

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* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
AaA Alwilda	0-6	Loam	ML, CL-ML	A-4, A-6	0	100	100	85-100	55-70	25-40	3-15
	6-23	Fine sandy loam, sandy loam.	SM	A-4	0	100	100	75-100	35-50	20-30	NP-7
	23-29	Loamy fine sand, loamy sand.	SM, SM-SC	A-2	0	100	100	50-100	15-35	<25	NP-5
	29-60	Gravelly sand, gravelly loamy sand, sand.	SP-SM, SW-SM, SM, SM-SC	A-1, A-2, A-3	0	60-90	45-80	25-70	5-30	<25	NP-5
Ar Arlo	0-7	Loam	ML, CL	A-4, A-6	0-5	100	95-100	85-100	60-85	30-40	5-15
	7-28	Loam, clay loam	ML, CL	A-4, A-6, A-7	0-5	100	95-100	85-100	60-80	30-45	5-20
	28-60	Gravelly sand, loamy sand, gravelly loamy sand.	GM, SM, GP-GM, SP-SM	A-2, A-1, A-3	0-5	60-100	50-75	40-65	5-35	<25	NP
BaA, BaB Beadle	0-6	Loam	CL, ML	A-6, A-7	0-5	95-100	95-100	85-100	65-95	30-50	10-20
	6-31	Clay loam, clay	CL, CH	A-7	0-5	90-100	85-100	75-95	55-95	40-60	15-35
	31-60	Clay loam, clay	CL, CH, ML, MH	A-6, A-7	0-5	90-100	85-100	75-95	55-85	35-55	15-25
BdA*: Beadle	0-6	Loam	CL, ML	A-6, A-7	0-5	95-100	95-100	85-100	65-95	30-50	10-20
	6-31	Clay loam, clay	CL, CH	A-7	0-5	90-100	85-100	75-95	55-95	40-60	15-35
	31-60	Clay loam, clay	CL, CH, ML, MH	A-6, A-7	0-5	90-100	85-100	75-95	55-85	35-55	15-25
Dudley	0-9	Silt loam	CL	A-4, A-6, A-7	0	95-100	95-100	90-100	65-90	30-45	10-22
	9-21	Clay loam, silty clay loam, clay.	CL, CH, MH	A-7	0	95-100	95-100	85-100	65-85	40-60	15-35
	21-30	Clay loam, silty clay loam, clay.	CL, CH	A-6, A-7	0	95-100	95-100	85-100	65-85	35-60	15-35
	30-60	Loam, clay loam	CL, CH	A-6, A-7	0	95-100	90-100	80-100	55-80	30-60	11-35
BeE*: Betts	0-3	Loam	CL, CL-ML	A-4, A-6	0-5	90-100	80-100	75-100	60-75	20-38	5-15
	3-23	Loam, clay loam	CL	A-6, A-7	0-5	90-100	85-100	75-100	50-85	30-45	10-25
	23-60	Clay loam, loam	CL	A-6, A-7	0-5	90-100	85-100	75-100	50-85	30-45	10-25
Ethan	0-8	Loam	CL	A-4, A-6	0	95-100	90-100	80-95	55-80	30-40	8-15
	8-22	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-80	30-50	10-25
	22-60	Loam, clay loam	CL	A-4, A-6, A-7	0-5	90-100	85-100	75-100	50-95	28-45	8-20
BnA, BnB Blendon	0-11	Fine sandy loam	SM	A-4	0	100	90-100	60-100	35-50	20-30	NP-5
	11-33	Fine sandy loam, sandy loam, loam.	SM, SC, ML, CL	A-4	0	100	85-100	60-100	35-60	20-33	NP-10
	33-60	Fine sandy loam, loamy fine sand, loamy sand.	SP-SM, SM, SM-SC	A-2, A-4	0	85-100	65-100	50-100	10-45	<30	NP-5
Bo Bon	0-28	Loam	CL-ML, CL	A-4, A-6	0	100	95-100	80-95	60-85	25-40	5-15
	28-60	Stratified silty clay loam to fine sandy loam.	CL, ML, CL-ML	A-4, A-6	0	100	95-100	80-95	60-85	25-40	3-15
Bx Bon	0-28	Loam	CL-ML, CL	A-4, A-6	0	100	90-100	80-95	60-85	25-40	5-15
	28-60	Stratified silty clay loam to fine sandy loam.	CL, CL-ML, ML	A-4, A-6	0	100	95-100	80-95	60-85	25-40	3-15

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Ca--------------- Clamo	0-19	Silty clay loam, silty, clay.	CL, CH, MH, ML	A-7	0	100	95-100	90-100	85-100	45-75	20-40
	19-60	Silty clay loam, silty clay.	CL, CH, MH, ML	A-7	0	100	95-100	90-100	85-100	45-75	20-40
CbB-------------- Clarno	0-8	Loam-------------	CL, CL-ML	A-4, A-6	0	100	95-100	85-100	55-90	25-40	5-15
	8-32	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-85	30-45	10-20
	32-60	Loam, clay loam	CL	A-6, A-7	0-5	90-100	90-100	80-100	50-80	30-45	10-20
CeC*:											
Clarno-----------	0-8	Loam-------------	CL, CL-ML	A-4, A-6	0	100	95-100	85-100	55-90	25-40	5-15
	8-32	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-85	30-45	10-20
	32-60	Loam, clay loam	CL	A-6, A-7	0-5	90-100	90-100	80-100	50-80	30-45	10-20
Ethan------------	0-8	Loam-------------	CL	A-4, A-6	0	95-100	90-100	80-95	55-80	30-40	8-15
	8-22	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-80	30-50	10-25
	22-60	Loam, clay loam	CL	A-4, A-6, A-7	0-5	90-100	85-100	75-100	50-95	28-45	8-20
CpA*:											
Clarno-----------	0-8	Loam-------------	CL, CL-ML	A-4, A-6	0	100	95-100	85-100	55-90	25-40	5-15
	8-32	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-85	30-45	10-20
	32-60	Loam, clay loam	CL	A-6, A-7	0-5	90-100	90-100	80-100	50-80	30-45	10-20
Prosper----------	0-12	Loam-------------	CL	A-4, A-6	0	95-100	95-100	85-100	60-90	25-40	8-20
	12-27	Clay loam, silty clay loam.	CL, ML	A-6, A-7	0	95-100	95-100	85-100	60-90	35-50	10-25
	27-33	Clay loam, loam	CL	A-6, A-7	0-5	95-100	95-100	80-95	55-85	30-50	10-25
	33-60	Clay loam, loam	CL	A-6, A-7	0-5	95-100	95-100	80-95	55-85	30-50	10-25
DaA*:											
DeGrey-----------	0-9	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-95	25-40	5-15
	9-18	Silty clay, silty clay loam.	CL, CH	A-7	0	100	100	90-100	80-100	40-65	15-35
	18-48	Silty clay, silty clay loam.	CL, CH	A-7	0	100	95-100	90-100	80-100	40-65	15-35
	48-60	Loam, clay loam	CL, CH, MH, ML	A-6, A-7	0	100	95-100	90-100	80-100	30-65	12-32
Jerauld----------	0-3	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	60-100	25-40	5-15
	3-8	Silty clay, clay, clay loam.	CH, CL	A-7	0	95-100	95-100	90-100	55-95	45-70	20-40
	8-19	Silty clay, clay, clay loam.	CH, CL	A-7	0	95-100	95-100	90-100	55-95	45-70	20-40
	19-60	Silty clay, clay, clay loam.	CL, CH, MH, ML	A-7	0	95-100	95-100	85-100	55-90	40-85	20-45
DeA*:											
DeGrey-----------	0-9	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-95	25-40	5-15
	9-18	Silty clay, silty clay loam.	CL, CH	A-7	0	100	100	90-100	80-100	40-65	15-35
	18-48	Silty clay, silty clay loam.	CL, CH	A-7	0	100	95-100	90-100	80-100	40-65	15-35
	48-60	Loam, clay loam	CL, CH, MH, ML	A-6, A-7	0	100	95-100	90-100	80-100	30-65	12-32
Onita------------	0-12	Silt loam--------	CL, ML	A-4, A-6, A-7	0	100	95-100	90-100	70-100	30-45	7-20
	12-35	Silty clay loam, clay loam, silty clay.	CL, CH, ML, MH	A-6, A-7	0	100	95-100	90-100	75-100	35-60	10-35
	35-60	Silty clay loam, clay loam, silty clay.	CL, CH	A-6, A-7	0-5	95-100	95-100	85-100	65-100	30-55	10-30

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
DmA*, DmB*:											
Delmont---------	0-5	Loam-------------	CL	A-6, A-4	0	90-100	90-100	80-95	60-75	28-40	8-20
	5-16	Loam, fine sandy loam, sandy loam.	SC, CL, CL-ML, SM-SC	A-4, A-6	0	80-100	70-100	50-100	35-70	20-40	5-18
	16-60	Gravelly sand, gravelly loamy sand.	SM, SW-SM, SM-SC, SW	A-1, A-2	0-5	60-100	40-70	15-50	3-30	<25	NP-5
Enet------------	0-7	Loam-------------	ML, CL	A-4, A-6	0	90-100	85-100	70-95	55-80	30-40	5-15
	7-24	Loam, clay loam, sandy clay loam.	CL, ML, SC, SM	A-4, A-6	0	90-100	85-100	70-95	45-75	30-40	5-15
	24-60	Gravelly loamy sand, gravelly sand, sand and gravel.	SW, SW-SM, SM, SM-SC	A-1, A-2, A-3	0	60-95	45-85	10-60	0-15	<25	NP-5
DnC*:											
Delmont---------	0-5	Loam-------------	CL	A-6, A-4	0	90-100	90-100	80-95	60-75	28-40	8-20
	5-16	Loam, fine sandy loam, sandy loam.	SC, CL, CL-ML, SM-SC	A-4, A-6	0	80-100	70-100	50-100	35-70	20-40	5-18
	16-60	Gravelly sand, gravelly loamy sand.	SM, SW-SM, SM-SC, SW	A-1, A-2	0-5	60-100	40-70	15-50	3-30	<25	NP-5
Talmo-----------	0-9	Gravelly loam----	ML, CL, SM, SC	A-4, A-6	0-5	90-100	60-80	50-75	35-60	25-40	5-15
	9-60	Gravelly sand----	GW, GM, SW, SM	A-2, A-1	0-10	40-95	30-65	15-35	0-35	<25	NP-5
Do--------------- Dimo	0-7	Loam-------------	CL	A-4, A-6	0	100	100	85-100	60-75	30-40	8-15
	7-31	Clay loam, loam, sandy clay loam.	CL	A-6, A-7	0	90-100	85-100	85-95	50-80	35-45	12-20
	31-60	Sand and gravel, gravelly sand.	SM, SP-SM, SW-SM, SM-SC	A-1, A-2, A-3	0-5	60-90	40-70	20-60	5-30	<25	NP-5
DsA*:											
Dudley----------	0-9	Silt loam--------	CL	A-4, A-6, A-7	0	95-100	95-100	90-100	65-90	30-45	10-22
	9-21	Clay loam, silty clay loam, clay.	CL, CH, MH	A-7	0	95-100	95-100	85-100	65-85	40-60	15-35
	21-30	Clay loam, silty clay loam, clay.	CL, CH	A-6, A-7	0	95-100	95-100	85-100	65-85	35-60	15-35
	30-60	Loam, clay loam	CL, CH	A-6, A-7	0	95-100	90-100	80-100	55-80	30-60	11-35
Jerauld---------	0-3	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	60-100	25-40	5-15
	3-8	Silty clay, clay, clay loam.	CH, CL	A-7	0	95-100	95-100	90-100	55-95	45-70	20-40
	8-19	Silty clay, clay, clay loam.	CH, CL	A-7	0	95-100	95-100	90-100	55-95	45-70	20-40
	19-60	Silty clay, clay, clay loam.	CL, CH, MH, ML	A-7	0	95-100	95-100	85-100	55-90	40-85	20-45
Du--------------- Durrstein	0-2	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	100	85-100	60-90	20-35	3-15
	2-18	Silty clay, clay, clay loam.	CH, MH	A-7	0	95-100	95-100	85-100	65-95	50-85	20-50
	18-60	Silty clay, clay, clay loam.	CH, CL	A-7	0	95-100	95-100	85-100	60-95	40-75	15-50
EdA*:											
Eakin-----------	0-5	Silt loam--------	ML, CL	A-4, A-6, A-7	0	100	100	95-100	90-100	30-45	5-20
	5-26	Silty clay loam, silt loam.	CL, ML	A-6, A-7	0	100	95-100	95-100	80-100	35-50	10-25
	26-60	Clay loam, loam, clay.	CL, CH	A-7	0	95-100	85-100	75-100	60-95	40-70	16-42

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
EdA*:											
DeGrey----------	0-9	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-95	25-40	5-15
	9-18	Silty clay, silty clay loam.	CL, CH	A-7	0	100	100	90-100	80-100	40-65	15-35
	18-48	Silty clay, silty clay loam.	CL, CH	A-7	0	100	95-100	90-100	80-100	40-65	15-35
	48-60	Loam, clay loam	CL, CH, MH, ML	A-6, A-7	0	100	95-100	90-100	80-100	30-65	12-32
EeB*:											
Eakin-----------	0-5	Silt loam--------	ML, CL	A-4, A-6, A-7	0	100	100	95-100	90-100	30-45	5-20
	5-26	Silty clay loam, silt loam.	CL, ML	A-6, A-7	0	100	95-100	95-100	80-100	35-50	10-25
	26-60	Clay loam, loam, clay.	CL, CH	A-7	0	95-100	85-100	75-100	60-95	40-70	16-42
Ethan-----------	0-8	Loam-------------	CL	A-4, A-6	0	95-100	90-100	80-95	55-80	30-40	8-15
	8-22	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-80	30-50	10-25
	22-60	Loam, clay loam	CL	A-4, A-6, A-7	0-5	90-100	85-100	75-100	50-95	28-45	8-20
EnA-------------- Enet	0-7	Loam-------------	ML, CL	A-4, A-6	0	90-100	85-100	70-95	55-80	30-40	5-15
	7-24	Loam, clay loam, sandy clay loam.	CL, ML, SC, SM	A-4, A-6	0	90-100	85-100	70-95	45-75	30-40	5-15
	24-60	Gravelly loamy sand, gravelly sand, sand and gravel.	SW, SW-SM, SM, SM-SC	A-1, A-2, A-3	0	60-95	45-85	10-60	0-15	<25	NP-5
EtD*:											
Ethan-----------	0-8	Loam-------------	CL	A-4, A-6	0	95-100	90-100	80-95	55-80	30-40	8-15
	8-22	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-80	30-50	10-25
	22-60	Loam, clay loam	CL	A-4, A-6, A-7	0-5	90-100	85-100	75-100	50-95	28-45	8-20
Betts-----------	0-3	Loam-------------	CL, CL-ML	A-4, A-6	0-5	90-100	80-100	75-100	60-75	20-38	5-15
	3-23	Loam, clay loam	CL	A-6, A-7	0-5	90-100	85-100	75-100	50-85	30-45	10-25
	23-60	Clay loam, loam	CL	A-6, A-7	0-5	90-100	85-100	75-100	50-85	30-45	10-25
HbA*:											
Highmore--------	0-8	Silt loam--------	ML, CL	A-4, A-6, A-7	0	100	95-100	95-100	90-100	30-45	5-20
	8-19	Silty clay loam	CL	A-6, A-7	0	100	95-100	90-100	85-100	35-50	15-25
	19-50	Silty clay loam, silt loam.	ML, CL	A-6, A-7	0	100	95-100	90-100	85-100	30-45	10-22
	50-60	Clay loam, loam	CL, CH	A-7	0-5	95-100	85-100	75-100	60-95	40-70	16-42
Onita-----------	0-12	Silt loam--------	CL, ML	A-4, A-6, A-7	0	100	95-100	90-100	70-100	30-45	7-20
	12-35	Silty clay loam, clay loam, silty clay.	CL, CH, ML, MH	A-6, A-7	0	100	95-100	90-100	75-100	35-60	10-35
	35-60	Silty clay loam, clay loam, silty clay.	CL, CH	A-6, A-7	0-5	95-100	95-100	85-100	65-100	30-55	10-30
HdA*, HdB*:											
Houdek----------	0-7	Loam-------------	CL	A-4, A-6, A-7	0	95-100	95-100	85-100	60-85	30-45	8-20
	7-19	Clay loam--------	CL	A-6, A-7	0	95-100	95-100	85-100	60-80	30-50	10-25
	19-31	Clay loam, loam	CL	A-6, A-7	0-5	95-100	95-100	85-100	60-80	30-50	10-25
	31-60	Clay loam, loam	CL	A-6, A-7	0-5	90-100	90-100	80-100	55-80	30-50	10-25
Dudley----------	0-9	Silt loam--------	CL	A-4, A-6, A-7	0	95-100	95-100	90-100	65-90	30-45	10-22
	9-21	Clay loam, silty clay loam, clay.	CL, CH, MH	A-7	0	95-100	95-100	85-100	65-85	40-60	15-35
	21-30	Clay loam, silty clay loam, clay.	CL, CH	A-6, A-7	0	95-100	95-100	85-100	65-85	35-60	15-35
	30-60	Loam, clay loam	CL, CH	A-6, A-7	0	95-100	90-100	80-100	55-80	30-60	11-35

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
HeB*, HeC*:											
Houdek----------	0-7	Loam-------------	CL	A-4, A-6, A-7	0	95-100	95-100	85-100	60-85	30-45	8-20
	7-19	Clay loam--------	CL	A-6, A-7	0	95-100	95-100	85-100	60-80	30-50	10-25
	19-31	Clay loam, loam	CL	A-6, A-7	0-5	95-100	95-100	85-100	60-80	30-50	10-25
	31-60	Clay loam, loam	CL	A-6, A-7	0-5	90-100	90-100	80-100	55-80	30-50	10-25
Ethan-----------	0-8	Loam-------------	CL	A-4, A-6	0	95-100	90-100	80-95	55-80	30-40	8-15
	8-22	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-80	30-50	10-25
	22-60	Loam, clay loam	CL	A-4, A-6, A-7	0-5	90-100	85-100	75-100	50-95	28-45	8-20
HhA*:											
Houdek----------	0-7	Loam-------------	CL	A-4, A-6, A-7	0	95-100	95-100	85-100	60-85	30-45	8-20
	7-19	Clay loam--------	CL	A-6, A-7	0	95-100	95-100	85-100	60-80	30-50	10-25
	19-31	Clay loam, loam	CL	A-6, A-7	0-5	95-100	95-100	85-100	60-80	30-50	10-25
	31-60	Clay loam, loam	CL	A-6, A-7	0-5	90-100	90-100	80-100	55-80	30-50	10-25
Hoven-----------	0-4	Silt loam--------	ML, CL, CL-ML	A-4, A-6, A-7	0	100	100	90-100	75-95	27-45	5-20
	4-10	Silty clay, clay, clay loam.	CH, MH, CL	A-7	0	100	95-100	95-100	80-100	45-80	20-40
	10-25	Silty clay, clay, clay loam.	CH, MH, CL	A-7	0	100	95-100	95-100	80-100	45-80	20-40
	25-60	Silty clay, clay, clay loam.	CL, CH	A-6, A-7	0	95-100	90-100	80-100	60-100	35-75	11-45
HhB*:											
Houdek----------	0-7	Loam-------------	CL	A-4, A-6, A-7	0	95-100	95-100	85-100	60-85	30-45	8-20
	7-19	Clay loam--------	CL	A-6, A-7	0	95-100	95-100	85-100	60-80	30-50	10-25
	19-31	Clay loam, loam	CL	A-6, A-7	0-5	95-100	95-100	85-100	60-80	30-50	10-25
	31-60	Clay loam, loam	CL	A-6, A-7	0-5	90-100	90-100	80-100	55-80	30-50	10-25
Hoven-----------	0-4	Silt loam--------	ML, CL, CL-ML	A-4, A-6, A-7	0	100	100	90-100	75-95	27-45	5-20
	4-10	Silty clay, clay, clay loam.	CH, MH, CL	A-7	0	100	95-100	95-100	80-100	45-80	20-40
	10-25	Silty clay, clay, clay loam.	CH, MH, CL	A-7	0	100	95-100	95-100	80-100	45-80	20-40
	25-60	Silty clay, clay, clay loam.	CL, CH	A-6, A-7	0	95-100	90-100	80-100	60-100	35-75	11-45
HoB*:											
Houdek----------	0-7	Loam-------------	CL	A-4, A-6, A-7	0	95-100	95-100	85-100	60-85	30-45	8-20
	7-19	Clay loam--------	CL	A-6, A-7	0	95-100	95-100	85-100	60-80	30-50	10-25
	19-31	Clay loam, loam	CL	A-6, A-7	0-5	95-100	95-100	85-100	60-80	30-50	10-25
	31-60	Clay loam, loam	CL	A-6, A-7	0-5	90-100	90-100	80-100	55-80	30-50	10-25
Plankinton------	0-8	Silt loam--------	ML, CL	A-4, A-6	0	100	100	90-100	80-100	27-40	5-15
	8-28	Clay, silty clay, clay loam.	CH, MH, CL, ML	A-7	0	100	95-100	90-100	70-100	40-70	15-35
	28-60	Clay, silty clay loam, clay loam.	CH, CL	A-6, A-7	0	95-100	90-100	85-100	65-100	30-60	15-30
HpA*:											
Houdek----------	0-7	Loam-------------	CL	A-4, A-6, A-7	0	95-100	95-100	85-100	60-85	30-45	8-20
	7-19	Clay loam--------	CL	A-6, A-7	0	95-100	95-100	85-100	60-80	30-50	10-25
	19-31	Clay loam, loam	CL	A-6, A-7	0-5	95-100	95-100	85-100	60-80	30-50	10-25
	31-60	Clay loam, loam	CL	A-6, A-7	0-5	90-100	90-100	80-100	55-80	30-50	10-25
Prosper---------	0-12	Loam-------------	CL	A-4, A-6	0	95-100	95-100	85-100	60-90	25-40	8-20
	12-27	Clay loam, silty clay loam.	CL, ML	A-6, A-7	0	95-100	95-100	85-100	60-90	35-50	10-25
	27-33	Clay loam, loam	CL	A-6, A-7	0-5	95-100	95-100	80-95	55-85	30-50	10-25
	33-60	Clay loam, loam	CL	A-6, A-7	0-5	95-100	95-100	80-95	55-85	30-50	10-25

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Hv Hoven	0-4	Silt loam	ML, CL, CL-ML	A-4, A-6, A-7	0	100	100	90-100	75-95	27-45	5-20
	4-10	Silty clay, clay, clay loam.	CH, MH, CL	A-7	0	100	95-100	95-100	80-100	45-80	20-40
	10-25	Silty clay, clay, clay loam.	CH, MH, CL	A-7	0	100	95-100	95-100	80-100	45-80	20-40
	25-60	Silty clay, clay, clay loam.	CL, CH	A-6, A-7	0	95-100	90-100	80-100	60-100	35-75	11-45
Hw*: Hoven	0-4	Silt loam	ML, CL, CL-ML	A-4, A-6, A-7	0	100	100	90-100	75-95	27-45	5-20
	4-10	Silty clay, clay, clay loam.	CH, MH, CL	A-7	0	100	95-100	95-100	80-100	45-80	20-40
	10-25	Silty clay, clay, clay loam.	CH, MH, CL	A-7	0	100	95-100	95-100	80-100	45-80	20-40
	25-60	Silty clay, clay, clay loam.	CL, CH	A-6, A-7	0	95-100	90-100	80-100	60-100	35-75	11-45
Plankinton	0-8	Silt loam	ML, CL	A-4, A-6	0	100	100	90-100	80-100	27-40	5-15
	8-28	Clay, silty clay, clay loam.	CH, MH, CL, ML	A-7	0	100	95-100	90-100	70-100	40-70	15-35
	28-60	Clay, silty clay loam, clay loam.	CH, CL	A-6, A-7	0	95-100	90-100	85-100	65-100	30-60	15-30
La Lane	0-8	Silty clay loam	CL, MH, ML, CH	A-6, A-7	0	100	100	95-100	75-100	35-55	11-25
	8-23	Silty clay, clay, silty clay loam.	CL, CH, MH, ML	A-7	0	100	95-100	90-100	75-100	45-65	15-35
	23-60	Silty clay, silty clay loam, clay loam.	CL, CH	A-7, A-6	0	100	95-100	85-100	65-100	35-65	15-40
MaA, MaB Millboro Variant	0-5	Silty clay	MH, CH	A-7	0	100	100	90-100	85-100	50-65	20-35
	5-42	Clay	MH, CH	A-7	0	100	100	90-100	85-100	50-80	20-50
	42-60	Weathered bedrock	MH, CH	A-7	0	100	95-100	90-100	85-100	50-80	20-50
Oa Onita	0-12	Silt loam	CL, ML	A-4, A-6, A-7	0	100	95-100	90-100	70-100	30-45	7-20
	12-35	Silty clay loam, clay loam, silty clay.	CL, CH, ML, MH	A-6, A-7	0	100	95-100	90-100	75-100	35-60	10-35
	35-60	Silty clay loam, clay loam, silt loam.	CL, CH	A-6, A-7	0-5	95-100	95-100	85-100	65-100	30-55	10-30
Pg*. Pits											
Pt*: Plankinton	0-8	Silt loam	ML, CL	A-4, A-6	0	100	100	90-100	80-100	27-40	5-15
	8-28	Clay, silty clay, clay loam.	CH, MH, CL, ML	A-7	0	100	95-100	90-100	70-100	40-70	15-35
	28-60	Clay, silty clay loam, clay loam.	CH, CL	A-6, A-7	0	95-100	90-100	85-100	65-100	30-60	15-30
Prosper	0-12	Loam	CL	A-4, A-6	0	95-100	95-100	85-100	60-90	25-40	8-20
	12-27	Clay loam, silty clay loam.	CL, ML	A-6, A-7	0	95-100	95-100	85-100	60-90	35-50	10-25
	27-33	Clay loam, loam	CL	A-6, A-7	0-5	95-100	95-100	80-95	55-85	30-50	10-25
	33-60	Clay loam, loam	CL	A-6, A-7	0-5	95-100	95-100	80-95	55-85	30-50	10-25
TaC Talmo	0-9	Gravelly loam	ML, CL, SM, SC	A-4, A-6	0-5	90-100	60-80	50-75	35-60	25-40	5-15
	9-60	Gravelly sand	GW, GM, SW, SM	A-2, A-1	0-10	40-95	30-65	15-35	0-35	<25	NP-5

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
TdE*:											
Talmo	0-9	Gravelly loam	ML, CL, SM, SC	A-4, A-6	0-5	90-100	60-80	50-75	35-60	25-40	5-15
	9-60	Gravelly sand	GW, GM, SW, SM	A-2, A-1	0-10	40-95	30-65	15-35	0-35	<25	NP-5
Delmont	0-5	Loam	CL	A-6, A-4	0	90-100	90-100	80-95	60-75	28-40	8-20
	5-16	Loam, fine sandy loam, sandy loam.	SC, CL, CL-ML, SM-SC	A-4, A-6	0	80-100	70-100	50-100	35-70	20-40	5-18
	16-60	Gravelly sand, gravelly loamy sand.	SM, SW-SM, SM-SC, SW	A-1, A-2	0-5	60-100	40-70	15-50	3-30	<25	NP-5
Te Tetonka	0-12	Silt loam	ML, CL	A-4, A-6, A-7	0	100	100	95-100	80-100	27-50	5-20
	12-35	Clay, silty clay, clay loam.	CL, CH, MH, ML	A-7	0	100	95-100	85-100	65-100	40-70	15-35
	35-60	Clay loam, silty clay, clay.	CL, CH	A-6, A-7	0	100	95-100	80-100	55-95	30-60	11-30
Wo Worthing	0-8	Silty clay loam	CL	A-7	0	100	100	95-100	85-95	42-50	17-22
	8-30	Silty clay, clay	CH, MH	A-7	0	100	100	95-100	85-100	50-70	22-35
	30-60	Silty clay, silty clay loam, clay loam.	CL, CH, ML, MH	A-7	0	100	95-100	90-100	70-95	40-65	15-30
Wp Worthing	0-8	Silty clay loam	CL	A-7	0	100	100	95-100	85-95	40-50	15-25
	8-30	Silty clay, clay	CH	A-7	0	100	100	95-100	80-100	50-70	25-40
	30-60	Silty clay, silty clay loam, clay loam.	CL, CH, ML, MH	A-7	0	100	95-100	90-100	70-95	40-65	15-30

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group
							K	T	
	In	In/hr	In/in	pH	Mmhos/cm				
AaA--------------	0-6	0.6-2.0	0.18-0.20	5.6-7.3	<2	Low--------	0.28	5	6
Alwilda	6-23	2.0-6.0	0.11-0.17	6.1-7.3	<2	Low--------	0.20		
	23-29	6.0-20	0.10-0.12	6.1-7.8	<2	Low--------	0.20		
	29-60	6.0-20	0.03-0.06	7.4-8.4	<2	Low--------	0.10		
Ar----------------	0-7	0.6-2.0	0.18-0.22	6.6-8.4	<2	Moderate	0.28	4	4L
Arlo	7-28	0.6-2.0	0.15-0.19	7.4-8.4	<2	Moderate	0.28		
	28-60	6.0-20.0	0.03-0.06	7.4-8.4	<4	Low--------	0.10		
BaA, BaB---------	0-6	0.6-2.0	0.18-0.22	6.1-7.3	<2	Low--------	0.28	5	6
Beadle	6-31	0.06-0.6	0.13-0.19	6.6-7.8	<2	High-------	0.28		
	31-60	0.2-0.6	0.13-0.17	7.4-8.4	2-4	Moderate	0.37		
BdA*:									
Beadle----------	0-6	0.6-2.0	0.18-0.22	6.1-7.3	<2	Low--------	0.28	5	6
	6-31	0.06-0.6	0.13-0.19	6.6-7.8	<2	High-------	0.28		
	31-60	0.2-0.6	0.13-0.17	7.4-8.4	2-4	Moderate	0.37		
Dudley----------	0-9	0.6-2.0	0.18-0.22	5.6-7.3	<2	Moderate	0.43	3	6
	9-21	<0.2	0.13-0.19	6.1-8.4	4-8	High-------	0.32		
	21-30	0.06-0.2	0.13-0.19	7.4-9.0	8-16	Moderate	0.32		
	30-60	0.06-0.6	0.13-0.19	7.9-9.0	8-16	Moderate	0.32		
BeE*:									
Betts-----------	0-3	0.6-2.0	0.16-0.18	6.6-8.4	<2	Moderate	0.28	5	4L
	3-23	0.6-2.0	0.17-0.20	7.4-8.4	<2	Moderate	0.37		
	23-60	0.2-0.6	0.17-0.20	7.4-8.4	2-8	Moderate	0.37		
Ethan-----------	0-8	0.6-2.0	0.18-0.20	6.1-7.8	<2	Moderate	0.28	5	6
	8-22	0.6-2.0	0.16-0.20	7.4-8.4	<2	Moderate	0.37		
	22-60	0.2-2.0	0.16-0.20	7.4-9.0	2-8	Moderate	0.37		
BnA, BnB---------	0-11	2.0-6.0	0.11-0.17	5.6-7.3	<2	Low--------	0.20	5	3
Blendon	11-33	0.6-6.0	0.11-0.18	6.1-7.3	<2	Low--------	0.20		
	33-60	2.0-20	0.08-0.15	6.6-8.4	<2	Low--------	0.20		
Bo, Bx-----------	0-28	0.6-2.0	0.19-0.22	6.6-8.4	<2	Low--------	0.24	5	6
Bon	28-60	0.6-2.0	0.13-0.17	7.4-8.4	<2	Low--------	0.32		
Ca----------------	0-19	0.06-0.2	0.16-0.19	6.1-7.8	<2	High-------	0.28	5	7
Clamo	19-60	0.06-0.2	0.13-0.18	6.6-8.4	2-8	High-------	0.28		
CbB--------------	0-8	0.6-2.0	0.18-0.20	6.1-7.3	<2	Low--------	0.28	5	6
Clarno	8-32	0.6-2.0	0.16-0.20	6.6-8.4	<2	Moderate	0.37		
	32-60	0.2-0.6	0.16-0.20	7.4-9.0	2-8	Moderate	0.37		
CeC*:									
Clarno----------	0-8	0.6-2.0	0.18-0.20	6.1-7.3	<2	Low--------	0.28	5	6
	8-32	0.6-2.0	0.16-0.20	6.6-8.4	<2	Moderate	0.37		
	32-60	0.2-0.6	0.16-0.20	7.4-9.0	2-8	Moderate	0.37		
Ethan-----------	0-8	0.6-2.0	0.18-0.20	6.1-7.8	<2	Moderate	0.28	5	6
	8-22	0.6-2.0	0.16-0.20	7.4-8.4	<2	Moderate	0.37		
	22-60	0.2-2.0	0.16-0.20	7.4-9.0	2-8	Moderate	0.37		
CpA*:									
Clarno----------	0-8	0.6-2.0	0.18-0.20	6.1-7.3	<2	Low--------	0.28	5	6
	8-32	0.6-2.0	0.16-0.20	6.6-8.4	<2	Moderate	0.37		
	32-60	0.2-0.6	0.16-0.20	7.4-9.0	2-8	Moderate	0.37		

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group
							K	T	
	In	In/hr	In/in	pH	Mmhos/cm				
CpA*:									
Prosper---------	0-12	0.6-2.0	0.18-0.22	5.6-7.8	<2	Moderate	0.28	5	6
	12-27	0.6-2.0	0.19-0.22	6.6-7.8	<2	Moderate	0.28		
	27-33	0.6-2.0	0.17-0.20	7.4-8.4	2-4	Moderate	0.28		
	33-60	0.2-0.6	0.17-0.20	7.4-8.4	2-8	Moderate	0.37		
DaA*:									
DeGrey----------	0-9	0.6-2.0	0.19-0.22	6.1-7.3	<2	Low-------	0.37	3	6
	9-18	<0.2	0.14-0.19	6.6-8.4	2-8	High------	0.37		
	18-48	0.06-0.6	0.11-0.17	7.4-8.4	2-8	High------	0.37		
	48-60	0.2-0.6	0.14-0.18	7.9-9.0	4-16	Moderate	0.37		
Jerauld---------	0-3	0.6-2.0	0.18-0.22	5.6-7.3	<4	Moderate	0.43	1	6
	3-8	<0.2	0.10-0.15	6.6-8.4	2-8	High------	0.32		
	8-19	<0.2	0.10-0.15	7.9-9.0	4-16	High------	0.32		
	19-60	<0.2	0.08-0.13	7.4-9.0	4-16	High------	0.32		
DeA*:									
DeGrey----------	0-9	0.6-2.0	0.19-0.22	6.1-7.3	<2	Low-------	0.37	3	6
	9-18	<0.2	0.14-0.19	6.6-8.4	2-8	High------	0.37		
	18-48	0.06-0.6	0.11-0.17	7.4-8.4	2-8	High------	0.37		
	48-60	0.2-0.6	0.14-0.18	7.9-9.0	4-16	Moderate	0.37		
Onita-----------	0-12	0.6-2.0	0.19-0.22	5.6-7.3	<2	Moderate	0.28	5	6
	12-35	0.2-0.6	0.11-0.17	6.1-7.3	<2	High------	0.43		
	35-60	0.2-0.6	0.17-0.20	7.4-8.4	<2	Moderate	0.43		
DmA*, DmB*:									
Delmont---------	0-5	0.6-2.0	0.18-0.20	6.6-7.8	<2	Low-------	0.28	3	6
	5-16	0.6-6.0	0.12-0.18	6.6-7.8	<2	Low-------	0.28		
	16-60	6.0-20	0.03-0.06	7.4-8.4	<2	Low-------	0.10		
Enet------------	0-7	0.6-2.0	0.18-0.20	5.6-7.3	<2	Low-------	0.28	4	6
	7-24	0.6-2.0	0.18-0.22	6.6-7.8	<2	Low-------	0.28		
	24-60	6.0-20	0.03-0.06	7.4-8.4	<2	Low-------	0.10		
DnC*:									
Delmont---------	0-5	0.6-2.0	0.18-0.20	6.6-7.8	<2	Low-------	0.28	3	6
	5-16	0.6-6.0	0.12-0.18	6.6-7.8	<2	Low-------	0.28		
	16-60	6.0-20	0.03-0.06	7.4-8.4	<2	Low-------	0.10		
Talmo-----------	0-9	0.6-2.0	0.11-0.15	6.6-7.8	<2	Low-------	0.20	2	8
	9-60	6.0-20	0.03-0.06	7.4-8.4	<2	Low-------	0.10		
Do--------------- Dimo	0-7	0.6-2.0	0.18-0.20	5.6-7.3	<2	Moderate	0.24	4	6
	7-31	0.6-2.0	0.16-0.20	6.1-7.8	<2	Moderate	0.24		
	31-60	6.0-20	0.03-0.06	7.4-8.4	<2	Low-------	0.10		
DsA*:									
Dudley----------	0-9	0.6-2.0	0.18-0.22	5.6-7.3	<2	Moderate	0.43	3	6
	9-21	<0.2	0.13-0.19	6.1-8.4	4-8	High------	0.32		
	21-30	0.06-0.2	0.13-0.19	7.4-9.0	8-16	Moderate	0.32		
	30-60	0.06-0.6	0.13-0.19	7.9-9.0	8-16	Moderate	0.32		
Jerauld---------	0-3	0.6-2.0	0.18-0.22	5.6-7.3	<4	Moderate	0.43	1	6
	3-8	<0.2	0.10-0.15	6.6-8.4	2-8	High------	0.32		
	8-19	<0.2	0.10-0.15	7.9-9.0	4-16	High------	0.32		
	19-60	<0.2	0.08-0.13	7.4-9.0	4-16	High------	0.32		
Du--------------- Durrstein	0-2	0.6-2.0	0.17-0.20	6.1-7.3	4-16	Low-------	0.37	1	7
	2-18	<0.2	0.10-0.15	6.6-9.0	4-16	High------	0.37		
	18-60	<0.2	0.08-0.13	7.4-9.0	4-16	High------	0.37		
EdA*:									
Eakin-----------	0-5	0.6-2.0	0.19-0.22	6.1-7.3	<2	Moderate	0.32	5	6
	5-26	0.6-2.0	0.18-0.21	6.6-8.4	<2	Moderate	0.43		
	26-60	0.2-0.6	0.16-0.20	7.4-9.0	<4	Moderate	0.43		

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group
							K	T	
	In	In/hr	In/in	pH	Mmhos/cm				
EdA*:									
DeGrey----------	0-9	0.6-2.0	0.19-0.22	6.1-7.3	<2	Low-------	0.37	3	6
	9-18	<0.2	0.14-0.19	6.6-8.4	2-8	High------	0.37		
	18-48	0.06-0.6	0.11-0.17	7.4-8.4	2-8	High------	0.37		
	48-60	0.2-0.6	0.14-0.18	7.9-9.0	4-16	Moderate	0.37		
EeB*:									
Eakin-----------	0-5	0.6-2.0	0.19-0.22	6.1-7.3	<2	Moderate	0.32	5	6
	5-26	0.6-2.0	0.18-0.21	6.6-8.4	<2	Moderate	0.43		
	26-60	0.2-0.6	0.16-0.20	7.4-9.0	<4	Moderate	0.43		
Ethan-----------	0-8	0.6-2.0	0.18-0.20	6.1-7.8	<2	Moderate	0.28	5	6
	8-22	0.6-2.0	0.16-0.20	7.4-8.4	<2	Moderate	0.37		
	22-60	0.2-2.0	0.16-0.20	7.4-9.0	2-8	Moderate	0.37		
EnA-------------- Enet	0-7	0.6-2.0	0.18-0.20	5.6-7.3	<2	Low-------	0.28	4	6
	7-24	0.6-2.0	0.18-0.22	6.6-7.8	<2	Low-------	0.28		
	24-60	6.0-20	0.03-0.06	7.4-8.4	<2	Low-------	0.10		
EtD*:									
Ethan-----------	0-8	0.6-2.0	0.18-0.20	6.1-7.8	<2	Moderate	0.28	5	6
	8-22	0.6-2.0	0.16-0.20	7.4-8.4	<2	Moderate	0.37		
	22-60	0.2-2.0	0.16-0.20	7.4-9.0	2-8	Moderate	0.37		
Betts-----------	0-3	0.6-2.0	0.16-0.18	6.6-8.4	<2	Moderate	0.28	5	4L
	3-23	0.6-2.0	0.17-0.20	7.4-8.4	<2	Moderate	0.37		
	23-60	0.2-0.6	0.17-0.20	7.4-8.4	2-8	Moderate	0.37		
HbA*:									
Highmore--------	0-8	0.6-2.0	0.19-0.22	6.1-7.3	<2	Low-------	0.32	5	6
	8-19	0.6-2.0	0.17-0.22	6.6-7.8	<2	Moderate	0.43		
	19-50	0.6-2.0	0.17-0.20	7.4-8.4	<2	Moderate	0.43		
	50-60	0.2-0.6	0.16-0.20	7.4-8.4	2-4	Moderate	0.43		
Onita-----------	0-12	0.6-2.0	0.19-0.22	5.6-7.3	<2	Moderate	0.28	5	6
	12-35	0.2-0.6	0.11-0.17	6.1-7.3	<2	High------	0.43		
	35-60	0.2-0.6	0.17-0.20	7.4-8.4	<2	Moderate	0.43		
HdA*, HdB*:									
Houdek----------	0-7	0.6-2.0	0.18-0.22	6.1-7.3	<2	Moderate	0.28	5	6
	7-19	0.6-2.0	0.16-0.22	6.6-7.8	<2	Moderate	0.37		
	19-31	0.6-2.0	0.17-0.20	7.4-8.4	<2	Moderate	0.37		
	31-60	0.2-0.6	0.17-0.20	7.4-8.4	<8	Moderate	0.37		
Dudley----------	0-9	0.6-2.0	0.18-0.22	5.6-7.3	<2	Moderate	0.43	3	6
	9-21	<0.2	0.13-0.19	6.1-8.4	4-8	High------	0.32		
	21-30	0.06-0.2	0.13-0.19	7.4-9.0	8-16	Moderate	0.32		
	30-60	0.06-0.6	0.13-0.19	7.9-9.0	8-16	Moderate	0.32		
HeB*, HeC*:									
Houdek----------	0-7	0.6-2.0	0.18-0.22	6.1-7.3	<2	Moderate	0.28	5	6
	7-19	0.6-2.0	0.16-0.22	6.6-7.8	<2	Moderate	0.37		
	19-31	0.6-2.0	0.17-0.20	7.4-8.4	<2	Moderate	0.37		
	31-60	0.2-0.6	0.17-0.20	7.4-8.4	<8	Moderate	0.37		
Ethan-----------	0-8	0.6-2.0	0.18-0.20	6.1-7.8	<2	Moderate	0.28	5	6
	8-22	0.6-2.0	0.16-0.20	7.4-8.4	<2	Moderate	0.37		
	22-60	0.2-2.0	0.16-0.20	7.4-9.0	2-8	Moderate	0.37		
HhA*:									
Houdek----------	0-7	0.6-2.0	0.18-0.22	6.1-7.3	<2	Moderate	0.28	5	6
	7-19	0.6-2.0	0.16-0.22	6.6-7.8	<2	Moderate	0.37		
	19-31	0.6-2.0	0.17-0.20	7.4-8.4	<2	Moderate	0.37		
	31-60	0.2-0.6	0.17-0.20	7.4-8.4	<8	Moderate	0.37		

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group
							K	T	
	In	In/hr	In/in	pH	Mmhos/cm				
HhA*:									
Hoven-----------	0-4	0.6-2.0	0.19-0.22	5.6-7.3	<2	Moderate	0.37	1	8
	4-10	<0.06	0.10-0.19	6.1-7.8	4-16	High------	0.37		
	10-25	<0.06	0.10-0.19	7.4-8.4	4-16	High------	0.37		
	25-60	<0.2	0.08-0.17	7.4-9.0	4-16	High------	0.37		
HhB*:									
Houdek----------	0-7	0.6-2.0	0.18-0.22	6.1-7.3	<2	Moderate	0.28	5	6
	7-19	0.6-2.0	0.16-0.22	6.6-7.8	<2	Moderate	0.37		
	19-31	0.6-2.0	0.17-0.20	7.4-8.4	<2	Moderate	0.37		
	31-60	0.2-0.6	0.17-0.20	7.4-8.4	<8	Moderate	0.37		
Hoven-----------	0-4	0.6-2.0	0.19-0.22	5.6-7.3	<2	Moderate	0.37	1	6
	4-10	<0.06	0.10-0.19	6.1-7.8	4-16	High------	0.37		
	10-25	<0.06	0.10-0.19	7.4-8.4	4-16	High------	0.37		
	25-60	<0.2	0.08-0.17	7.4-9.0	4-16	High------	0.37		
HoB*:									
Houdek----------	0-7	0.6-2.0	0.18-0.22	6.1-7.3	<2	Moderate	0.28	5	6
	7-19	0.6-2.0	0.16-0.22	6.6-7.8	<2	Moderate	0.37		
	19-31	0.6-2.0	0.17-0.20	7.4-8.4	<2	Moderate	0.37		
	31-60	0.2-0.6	0.17-0.20	7.4-8.4	<8	Moderate	0.37		
Plankinton------	0-8	0.6-2.0	0.19-0.22	5.6-7.3	<2	Moderate	0.24	3	6
	8-28	<0.2	0.10-0.22	6.1-8.4	<2	High------	0.32		
	28-60	0.06-0.6	0.08-0.17	6.6-8.4	2-8	High------	0.32		
HpA*:									
Houdek----------	0-7	0.6-2.0	0.18-0.22	6.1-7.3	<2	Moderate	0.28	5	6
	7-19	0.6-2.0	0.16-0.22	6.6-7.8	<2	Moderate	0.37		
	19-31	0.6-2.0	0.17-0.20	7.4-8.4	<2	Moderate	0.37		
	31-60	0.2-0.6	0.17-0.20	7.4-8.4	<8	Moderate	0.37		
Prosper---------	0-12	0.6-2.0	0.18-0.22	5.6-7.8	<2	Moderate	0.28	5	6
	12-27	0.6-2.0	0.19-0.22	6.6-7.8	<2	Moderate	0.28		
	27-33	0.6-2.0	0.17-0.20	7.4-8.4	2-4	Moderate	0.28		
	33-60	0.2-0.6	0.17-0.20	7.4-8.4	2-8	Moderate	0.37		
Hv---------------	0-4	0.6-2.0	0.19-0.22	5.6-7.3	<2	Moderate	0.37	1	6
Hoven	4-10	<0.06	0.10-0.19	6.1-7.8	4-16	High------	0.37		
	10-25	<0.06	0.10-0.19	7.4-8.4	4-16	High------	0.37		
	25-60	<0.2	0.08-0.17	7.4-9.0	4-16	High------	0.37		
Hw*:									
Hoven-----------	0-4	0.6-2.0	0.19-0.22	5.6-7.3	<2	Moderate	0.37	1	6
	4-10	<0.06	0.10-0.19	6.1-7.8	4-16	High------	0.37		
	10-25	<0.06	0.10-0.19	7.4-8.4	4-16	High------	0.37		
	25-60	<0.2	0.08-0.17	7.4-9.0	4-16	High------	0.37		
Plankinton------	0-8	0.6-2.0	0.19-0.22	5.6-7.3	<2	Moderate	0.24	3	6
	8-28	<0.2	0.10-0.22	6.1-8.4	<2	High------	0.32		
	28-60	0.06-0.6	0.08-0.17	6.6-8.4	2-8	High------	0.32		
La---------------	0-8	0.6-2.0	0.19-0.22	6.1-7.3	<2	Moderate	0.28	5	7
Lane	8-23	0.06-0.6	0.13-0.19	6.6-7.8	<2	High------	0.28		
	23-60	0.06-0.6	0.11-0.20	7.4-8.4	<4	High------	0.37		
MaA, MaB---------	0-5	0.06-0.2	0.13-0.18	6.6-7.8	<2	High------	0.37	5	4
Millboro Variant	5-42	0.06-0.2	0.08-0.14	7.4-8.4	<2	High------	0.37		
	42-60	<0.06	---	7.4-8.4	---	High------	0.37		
Oa---------------	0-12	0.6-2.0	0.19-0.22	5.6-7.3	<2	Moderate	0.28	5	6
Onita	12-35	0.2-0.6	0.11-0.17	6.1-7.3	<2	High------	0.43		
	35-60	0.2-0.6	0.17-0.20	7.4-8.4	<2	Moderate	0.43		
Pg*.									
Pits									

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group
							K	T	
	In	In/hr	In/in	pH	Mmhos/cm				
Pt*:									
Plankinton------	0-8	0.6-2.0	0.19-0.22	5.6-7.3	<2	Moderate	0.24	3	6
	8-28	<0.2	0.10-0.22	6.1-8.4	<2	High------	0.32		
	28-60	0.06-0.6	0.08-0.17	6.6-8.4	2-8	High------	0.32		
Prosper---------	0-12	0.6-2.0	0.18-0.22	5.6-7.8	<2	Moderate	0.28	5	6
	12-27	0.6-2.0	0.19-0.22	6.6-7.8	<2	Moderate	0.28		
	27-33	0.6-2.0	0.17-0.20	7.4-8.4	2-4	Moderate	0.28		
	33-60	0.2-0.6	0.17-0.20	7.4-8.4	2-8	Moderate	0.37		
TaC-------------- Talmo	0-9	0.6-2.0	0.11-0.15	6.6-7.8	<2	Low-------	0.20	2	8
	9-60	6.0-20	0.03-0.06	7.4-8.4	<2	Low-------	0.10		
TdE*:									
Talmo-----------	0-9	0.6-2.0	0.11-0.15	6.6-7.8	<2	Low-------	0.20	2	8
	9-60	6.0-20	0.03-0.06	7.4-8.4	<2	Low-------	0.10		
Delmont---------	0-5	0.6-2.0	0.18-0.20	6.6-7.8	<2	Low-------	0.28	3	6
	5-16	0.6-6.0	0.12-0.18	6.6-7.8	<2	Low-------	0.28		
	16-60	6.0-20	0.03-0.06	7.4-8.4	<2	Low-------	0.10		
Te--------------- Tetonka	0-12	0.6-2.0	0.19-0.22	5.6-7.3	<2	Moderate	0.24	3	6
	12-35	<0.06	0.13-0.19	6.1-7.8	<2	High------	0.32		
	35-60	0.06-0.6	0.11-0.17	6.6-8.4	2-8	High------	0.32		
Wo--------------- Worthing	0-8	0.2-0.6	0.19-0.22	5.6-7.3	<2	Moderate	0.37	5	7
	8-30	0.06-0.2	0.13-0.18	6.1-7.3	<2	High------	0.37		
	30-60	0.2-0.6	0.11-0.17	7.4-8.4	2-8	High------	0.37		
Wp--------------- Worthing	0-8	0.2-0.6	0.19-0.22	5.6-7.3	<2	High------	0.37	5	8
	8-30	0.06-0.2	0.13-0.18	6.1-7.8	<2	High------	0.37		
	30-60	0.2-0.6	0.11-0.17	7.4-8.4	2-8	High------	0.37		

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--SOIL AND WATER FEATURES

[The definitions of "flooding" and "water table" in the text explain terms such as "rare," "brief," "apparent," and "perched." The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
AaA Alwilda	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate	Low.
Ar Arlo	B	Frequent	Brief	Mar-Aug	0-2.0	Apparent	Oct-Jun	>60	---	High	High	Moderate.
BaA, BaB Beadle	C	None	---	---	>6.0	---	---	>60	---	Low	High	Moderate.
BdA*:												
Beadle	C	None	---	---	>6.0	---	---	>60	---	Low	High	Moderate.
Dudley	C	None	---	---	>6.0	---	---	>60	---	Moderate	High	High.
BeE*:												
Betts	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Moderate.
Ethan	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
BnA, BnB Blendon	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
Bo Bon	B	Frequent	Brief	Apr-Oct	>6.0	---	---	>60	---	Moderate	Moderate	Low.
Bx Bon	B	Frequent	Brief	Apr-Oct	2.0-6.0	Apparent	Oct-Jul	>60	---	High	Moderate	Low.
Ca Clamo	C/D	Occasional	Long	Mar-Oct	0-3.0	Apparent	Oct-Jun	>60	---	High	High	High.
CbB Clarno	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Moderate.
CeC*:												
Clarno	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Moderate.
Ethan	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
CpA*:												
Clarno	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Moderate.
Prosper	B	Occasional	Very brief	Oct-Jun	3.0-6.0	Perched	Oct-Jun	>60	---	High	High	Moderate.
DaA*:												
DeGrey	D	None	---	---	>6.0	---	---	>60	---	Low	High	Moderate.
Jerauld	D	None	---	---	>6.0	---	---	>60	---	Low	High	Moderate.

See footnote at end of table.

TABLE 15.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
DeA*:												
DeGrey	D	None	---	---	>6.0	---	---	>60	---	Low	High	Moderate.
Onita	C	Occasional	Brief	Mar-Oct	2.5-6.0	Perched	Oct-Jun	>60	---	High	High	Low.
DmA*, DmB*:												
Delmont	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate	Low.
Enet	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate	Low.
DnC*:												
Delmont	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate	Low.
Talmo	A	None	---	---	>6.0	---	---	>60	---	Low	Moderate	Low.
Do Dimo	B	Frequent	Very brief	Mar-Oct	2.0-6.0	Apparent	Oct-Jun	>60	---	High	High	Low.
DsA*:												
Dudley	C	None	---	---	>6.0	---	---	>60	---	Moderate	High	High.
Jerauld	D	None	---	---	>6.0	---	---	>60	---	Low	High	Moderate.
Du Durrstein	D	Frequent	Brief	Apr-Oct	0-1.0	Apparent	Oct-Jun	>60	---	Moderate	High	High.
EdA*:												
Eakin	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Moderate.
DeGrey	D	None	---	---	>6.0	---	---	>60	---	Low	High	Moderate.
EeB*:												
Eakin	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Moderate.
Ethan	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
EnA Enet	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate	Low.
EtD*:												
Ethan	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Betts	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Moderate.
HbA*:												
Highmore	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Low.
Onita	C	Occasional	Brief	Mar-Oct	2.5-6.0	Perched	Oct-Jun	>60	---	High	High	Low.
HdA*, HdB*:												
Houdek	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Moderate.
Dudley	C	None	---	---	>6.0	---	---	>60	---	Moderate	High	High.

See footnote at end of table.

TABLE 15.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
HeB*, HeC*:												
Houdek-----------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Moderate.
Ethan------------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
HhA*, HhB*:												
Houdek-----------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Moderate.
Hoven------------	D	None--------	---	---	+1-1.5	Perched	Mar-Jul	>60	---	Moderate	High-----	Moderate.
HoB*:												
Houdek-----------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Moderate.
Plankinton-------	D	None--------	---	---	+1-1.0	Perched	Mar-Jul	>60	---	Moderate	High-----	Moderate.
HpA*:												
Houdek-----------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Moderate.
Prosper----------	B	Occasional	Very brief	Oct-Jun	3.0-6.0	Perched	Oct-Jun	>60	---	High-----	High-----	Moderate.
Hv--------------- Hoven	D	None--------	---	---	+1-1.5	Perched	Mar-Jul	>60	---	Moderate	High-----	Moderate.
Hw*:												
Hoven------------	D	None--------	---	---	+1-1.5	Perched	Mar-Jul	>60	---	Moderate	High-----	Moderate.
Plankinton-------	D	None--------	---	---	+1-1.0	Perched	Mar-Jul	>60	---	Moderate	High-----	Moderate.
La--------------- Lane	C	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Moderate.
MaA, MaB---------- Millboro Variant	D	None--------	---	---	>6.0	---	---	40-60	Soft	Low------	High-----	Moderate.
Oa--------------- Onita	C	Frequent----	Brief-----	Mar-Oct	2.5-6.0	Perched	Oct-Jun	>60	---	High-----	High-----	Low.
Pg*. Pits												
Pt*:												
Plankinton-------	D	None--------	---	---	+1-1.0	Perched	Mar-Jul	>60	---	Moderate	High-----	Moderate.
Prosper----------	B	Frequent----	Very brief	Oct-Jun	3.0-6.0	Perched	Oct-Jun	>60	---	High-----	High-----	Moderate.
TaC-------------- Talmo	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Moderate	Low.
TdE*:												
Talmo------------	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Moderate	Low.
Delmont----------	B	None--------	---	---	>6.0	---	---	>60	---	Low------	Moderate	Low.

See footnote at end of table.

TABLE 15.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
Te Tetonka	C/D	None	---	---	+1-1.0	Perched	Jan-Dec	>60	---	High	High	Moderate.
Wo Worthing	D	None	---	---	+1-1.0	Perched	Jan-Dec	>60	---	High	High	Moderate.
Wp Worthing	D	None	---	---	+3-0.5	Perched	Jan-Dec	>60	---	High	High	High.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Alwilda	Sandy, mixed, mesic Typic Haplustolls
Arlo	Fine-loamy over sandy or sandy-skeletal, mesic Typic Calciaquolls
Beadle	Fine, montmorillonitic, mesic Typic Argiustolls
Betts	Fine-loamy, mixed (calcareous), mesic Typic Ustorthents
Blendon	Coarse-loamy, mixed, mesic Pachic Haplustolls
Bon	Fine-loamy, mixed, mesic Cumulic Haplustolls
Clamo	Fine, montmorillonitic, mesic Cumulic Haplaquolls
Clarno	Fine-loamy, mixed, mesic Typic Haplustolls
DeGrey	Fine, montmorillonitic, mesic Typic Natrustolls
Delmont	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Typic Haplustolls
Dimo	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Pachic Haplustolls
Dudley	Fine, montmorillonitic, mesic Typic Natrustolls
Durrstein	Fine, montmorillonitic, mesic Typic Natraquolls
Eakin	Fine-silty, mixed, mesic Typic Argiustolls
Enet	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Pachic Haplustolls
Ethan	Fine-loamy, mixed, mesic Entic Haplustolls
Highmore	Fine-silty, mixed, mesic Typic Argiustolls
Houdek	Fine-loamy, mixed, mesic Typic Argiustolls
Hoven	Fine, montmorillonitic, mesic Typic Natraquolls
Jerauld	Fine, montmorillonitic, mesic Leptic Natrustolls
Lane	Fine, montmorillonitic, mesic Pachic Argiustolls
Millboro Variant	Fine, montmorillonitic, mesic Vertic Argiustolls
Onita	Fine, montmorillonitic, mesic Pachic Argiustolls
Plankinton	Fine, montmorillonitic, mesic Typic Argialbolls
Prosper	Fine-loamy, mixed, mesic Pachic Argiustolls
Talmo	Sandy-skeletal, mixed, mesic Udorthentic Haplustolls
Tetonka	Fine, montmorillonitic, mesic Argiaquic Argialbolls
Worthing	Fine, montmorillonitic, mesic Typic Argiaquolls

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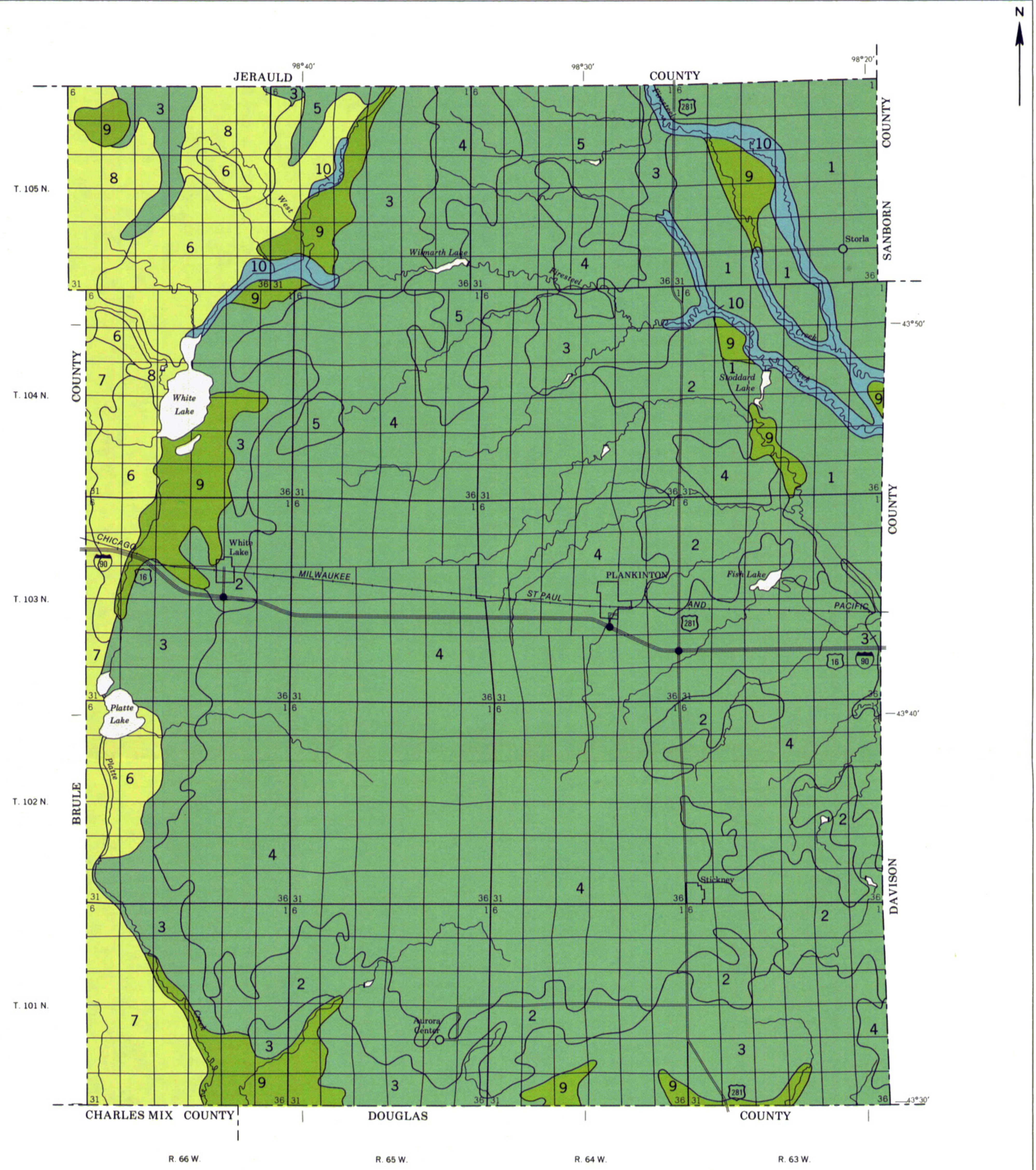


SOIL LEGEND*

WELL DRAINED TO POORLY DRAINED SOILS IN SWALES, DEPRESSIONS, AND OTHER AREAS ON UPLANDS

1	Clarno-Prosper-Plankinton association: Well drained, moderately well drained, and poorly drained, dominantly level to undulating, loamy and silty soils on broad flats and rises and in swales, depressions, and drainageways on uplands
2	Houdek-Prosper association: Well drained and moderately well drained, dominantly nearly level and undulating, loamy soils on broad flats and rises and in swales and drainageways on uplands
3	Houdek-Ethan association: Well drained, dominantly undulating to rolling, loamy soils on uplands
4	Houdek-Dudley-Hoven association: Well drained, moderately well drained, and poorly drained, dominantly level to undulating, loamy and silty soils on broad flats, rises, and side slopes and in depressions on uplands
5	Dudley-Beadle-Jerauld association: Well drained to somewhat poorly drained, nearly level and gently sloping, loamy and silty soils on uplands

WELL DRAINED AND MODERATELY WELL DRAINED SOILS ON RISES AND SIDE SLOPES AND IN SWALES AND OTHER AREAS ON UPLANDS

6	Highmore-Onita-DeGrey association: Well drained and moderately well drained, nearly level, silty soils on rises and side slopes and in swales on uplands
7	Eakin-DeGrey association: Well drained and moderately well drained, nearly level and gently undulating, silty soils on uplands
8	Eakin-Ethan association: Well drained, gently sloping to moderately steep, silty and loamy soils on uplands

WELL DRAINED TO EXCESSIVELY DRAINED SOILS ON TERRACES AND UPLANDS

9	Delmont-Enet-Talmo association: Well drained to excessively drained, nearly level to steep, loamy soils on terraces and uplands

POORLY DRAINED AND MODERATELY WELL DRAINED SOILS ON FLOOD PLAINS

10	Durrstein-Bon association: Poorly drained and moderately well drained, nearly level, silty and loamy soils on flood plains

*Texture terms in the descriptive headings refer to the texture of the surface layer of the major soils in each association.

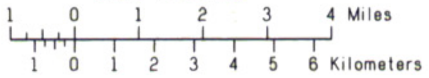
Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

Compiled 1980

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
SOUTH DAKOTA AGRICULTURAL EXPERIMENT STATION

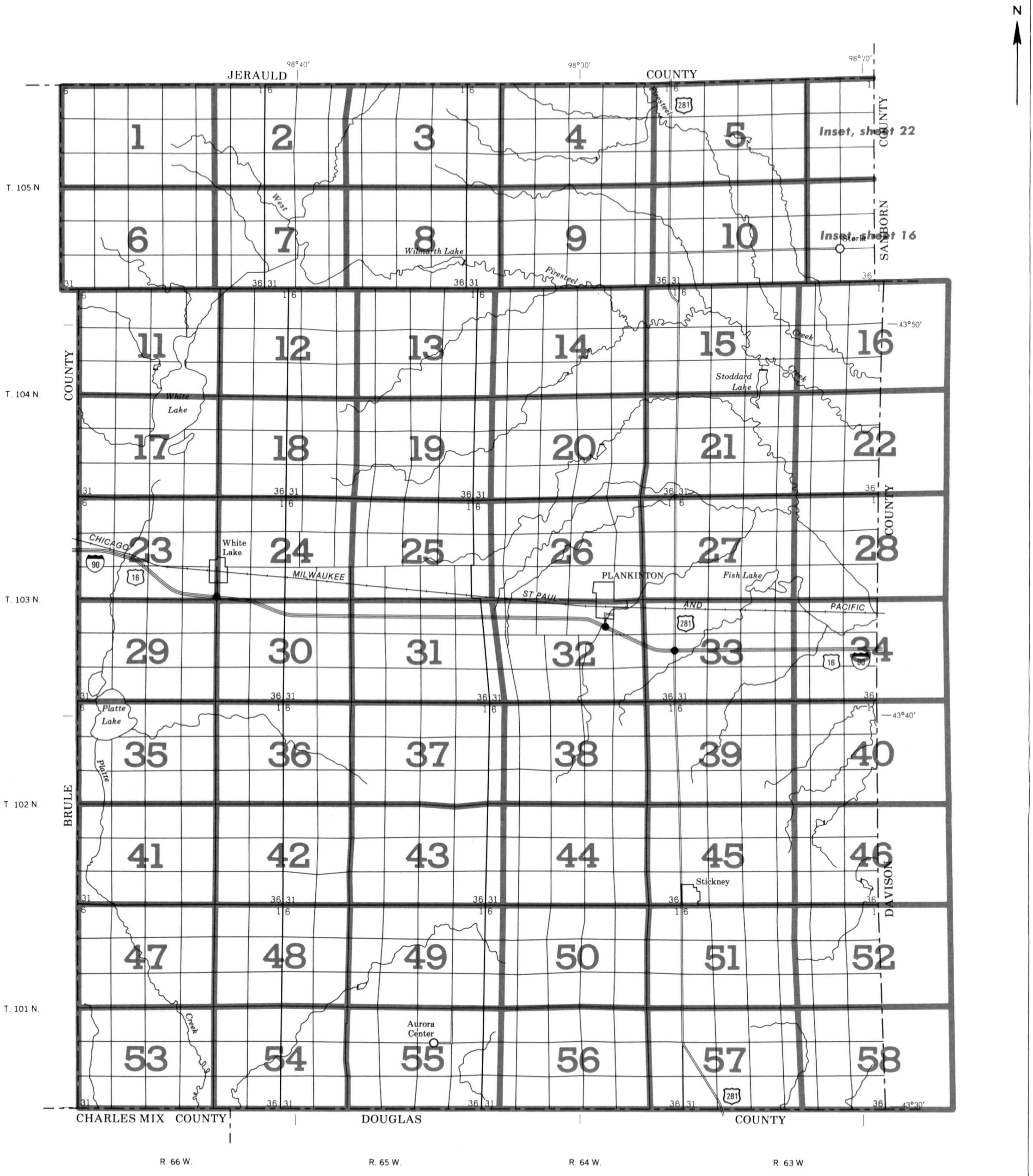
GENERAL SOIL MAP
AURORA COUNTY, SOUTH DAKOTA

Scale 1: 190,080



SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36



INDEX TO MAP SHEETS
AURORA COUNTY, SOUTH DAKOTA

Scale 1: 190.080

1 0 1 2 3 4 Miles

1 0 1 2 3 4 5 6 Kilometers

Original text from each individual map sheet read:
This map is compiled on 1975 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

SOIL LEGEND

Map symbols consist of a combination of letters. The first capital letter is the initial one of the map unit name. The lowercase letter that follows separates map units having names that begin with the same letter, except that it does not separate slope phases. The second capital letter indicates the class of slope. Symbols without a slope letter are for nearly level soils or miscellaneous areas.

SYMBOL	NAME
AaA	Alwilda loam, 0 to 2 percent slopes
Ar	Arlo loam
BaA	Beadle loam, 0 to 3 percent slopes
BaB	Beadle loam, 3 to 6 percent slopes
BdA	Beadle-Dudley complex, 0 to 3 percent slopes
BeE	Betts-Ethan loams, 15 to 40 percent slopes
BnA	Blendon fine sandy loam, 0 to 3 percent slopes
BnB	Blendon fine sandy loam, 3 to 6 percent slopes
Bo	Bon loam
Bx	Bon loam, channeled
Ca	Clamo silty clay loam
CbB	Clarno loam, 3 to 6 percent slopes
CeC	Clarno-Ethan loams, 6 to 9 percent slopes
CpA	Clarno-Prosper loams, 0 to 3 percent slopes
DaA	DeGrey-Jerauld silt loams, 0 to 2 percent slopes
DeA	DeGrey-Onita silt loams, 0 to 2 percent slopes
DmA	Delmont-Enet loams, 0 to 2 percent slopes
DmB	Delmont-Enet loams, 2 to 6 percent slopes
DnC	Delmont-Talmo complex, 6 to 15 percent slopes
Do	Dimo loam
DsA	Dudley-Jerauld silt loams, 0 to 2 percent slopes
Du	Durrstein silt loam
EdA	Eakin-DeGrey silt loams, 0 to 3 percent slopes
EeB	Eakin-Ethan complex, 2 to 6 percent slopes
EnA	Enet loam, 0 to 2 percent slopes
EtD	Ethan-Betts loams, 9 to 15 percent slopes
HbA	Highmore-Onita silt loams, 0 to 2 percent slopes
HdA	Houdek-Dudley complex, 0 to 3 percent slopes
HdB	Houdek-Dudley complex, 3 to 6 percent slopes
HeB	Houdek-Ethan loams, 2 to 6 percent slopes
HeC	Houdek-Ethan loams, 6 to 9 percent slopes
HhA	Houdek-Hoven complex, 0 to 3 percent slopes
HhB	Houdek-Hoven complex, 1 to 6 percent slopes
HoB	Houdek-Plankinton complex, 1 to 6 percent slopes
HpA	Houdek-Prosper loams, 0 to 3 percent slopes
Hv	Hoven silt loam
Hw	Hoven-Plankinton silt loams
La	Lane silty clay loam
MaA	Millboro Variant silty clay, 0 to 2 percent slopes
MaB	Millboro Variant silty clay, 2 to 6 percent slopes
Oa	Onita silt loam
Pg	Pits, gravel
Pt	Plankinton-Prosper complex
TaC	Talmo gravelly loam, 2 to 15 percent slopes
TdE	Talmo-Delmont complex, 15 to 40 percent slopes
Te	Tetonka silt loam
Wo	Worthing silty clay loam
Wp	Worthing silty clay loam, ponded

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

National, state or province

County or parish

Minor civil division

Reservation (national forest or park, state forest or park, and large airport)

Land grant

Limit of soil survey (label)

Field sheet matchline & neatline

AD HOC BOUNDARY (label)

Small airport, airfield, park, oilfield, cemetery, or flood pool — Davis Airstrip; FLOOD POOL LINE

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROADS

Divided (median shown if scale permits)

Other roads

Trail

ROAD EMBLEMS & DESIGNATIONS

Interstate — 79

Federal — 410

State — 52

County, farm or ranch — 378

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

Without road

With road

With railroad

DAMS

Large (to scale)

Medium or small — water; w

PITS

Gravel pit

Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

Farmstead, house (omit in urban areas)

Church

School

Indian mound (label) — Indian Mound

Located object (label) — Tower

Tank (label) — GAS

Wells, oil or gas

Windmill

Kitchen midden

WATER FEATURES

DRAINAGE

Perennial, double line

Perennial, single line

Intermittent

Drainage end

Canals or ditches

Double-line (label) — CANAL

Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

Perennial — water; w

Intermittent — int; i

MISCELLANEOUS WATER FEATURES

Marsh or swamp

Spring

Well, artesian

Well, irrigation

Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS — BaA TdE

ESCARPMENTS

Bedrock (points down slope)

Other than bedrock (points down slope)

SHORT STEEP SLOPE

GULLY

DEPRESSION OR SINK

SOIL SAMPLE SITE (normally not shown) — Ⓢ

MISCELLANEOUS

Blowout

Clay spot

Gravelly spot

Gumbo, slick or scabby spot (sodic) — ø

Dumps and other similar non soil areas

Prominent hill or peak

Rock outcrop (includes sandstone and shale)

Saline spot — +

Sandy spot

Severely eroded spot

Slide or slip (tips point upslope)

Stony spot, very stony spot

Borrow area up to 5 acres in size

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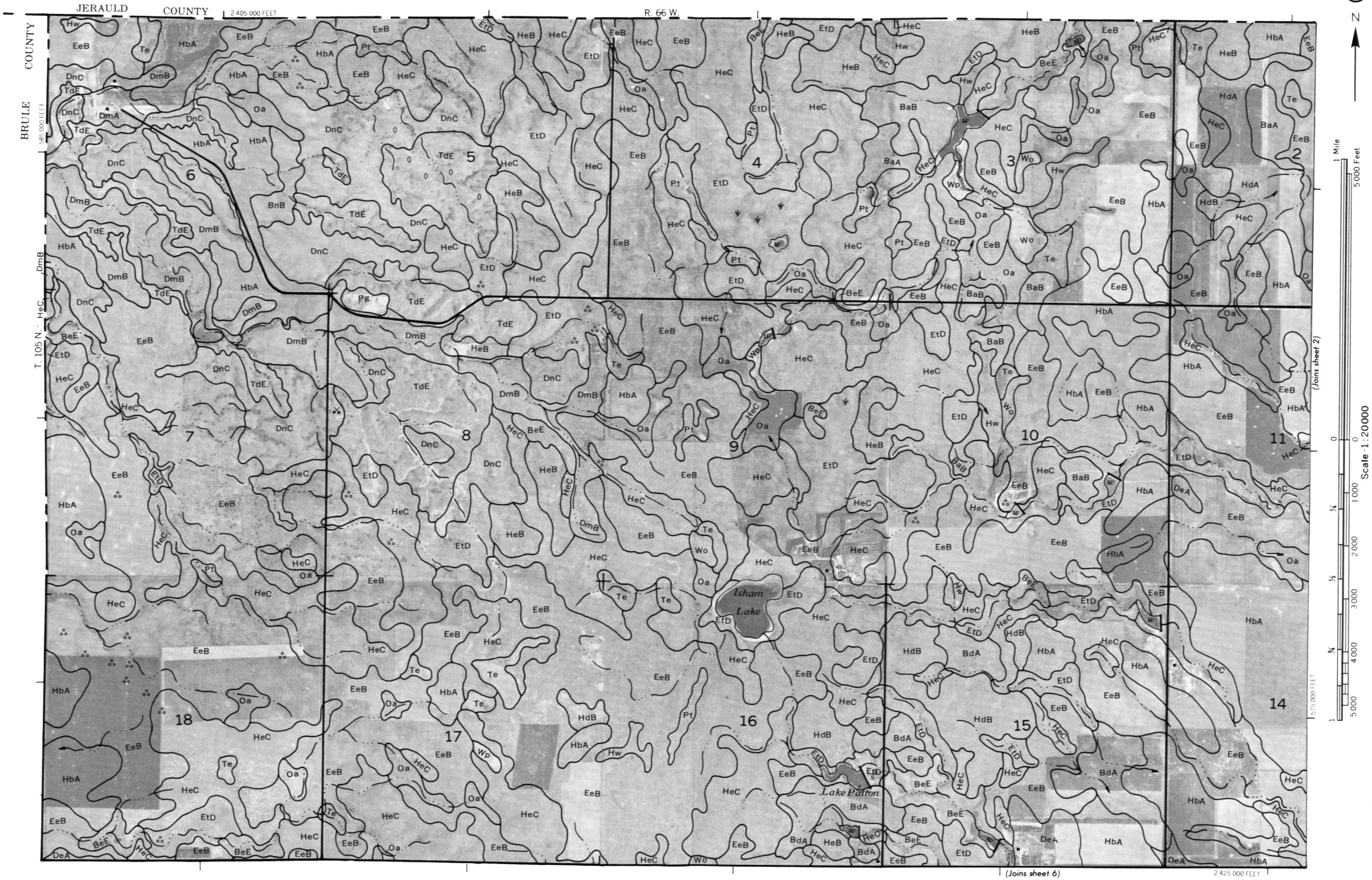

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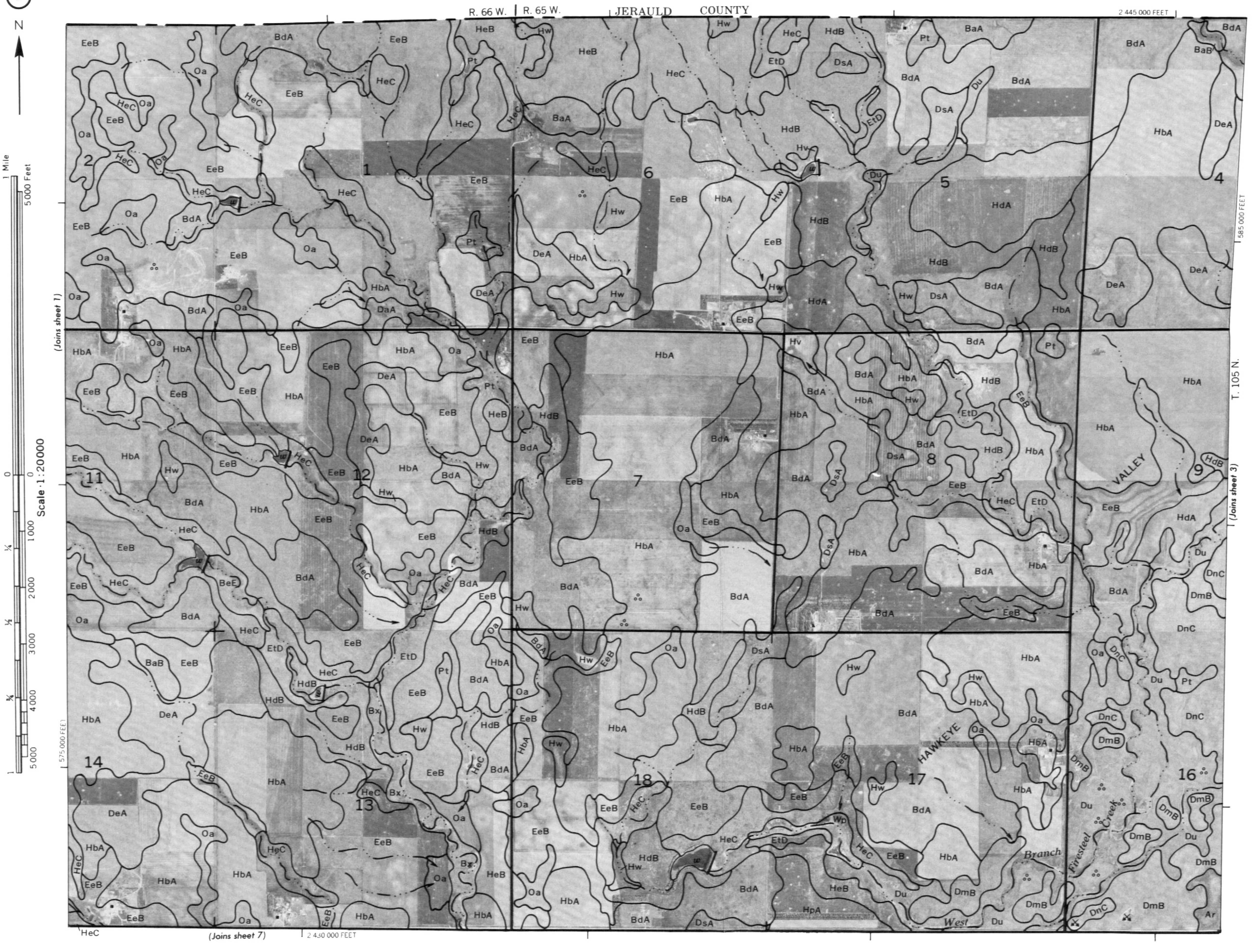

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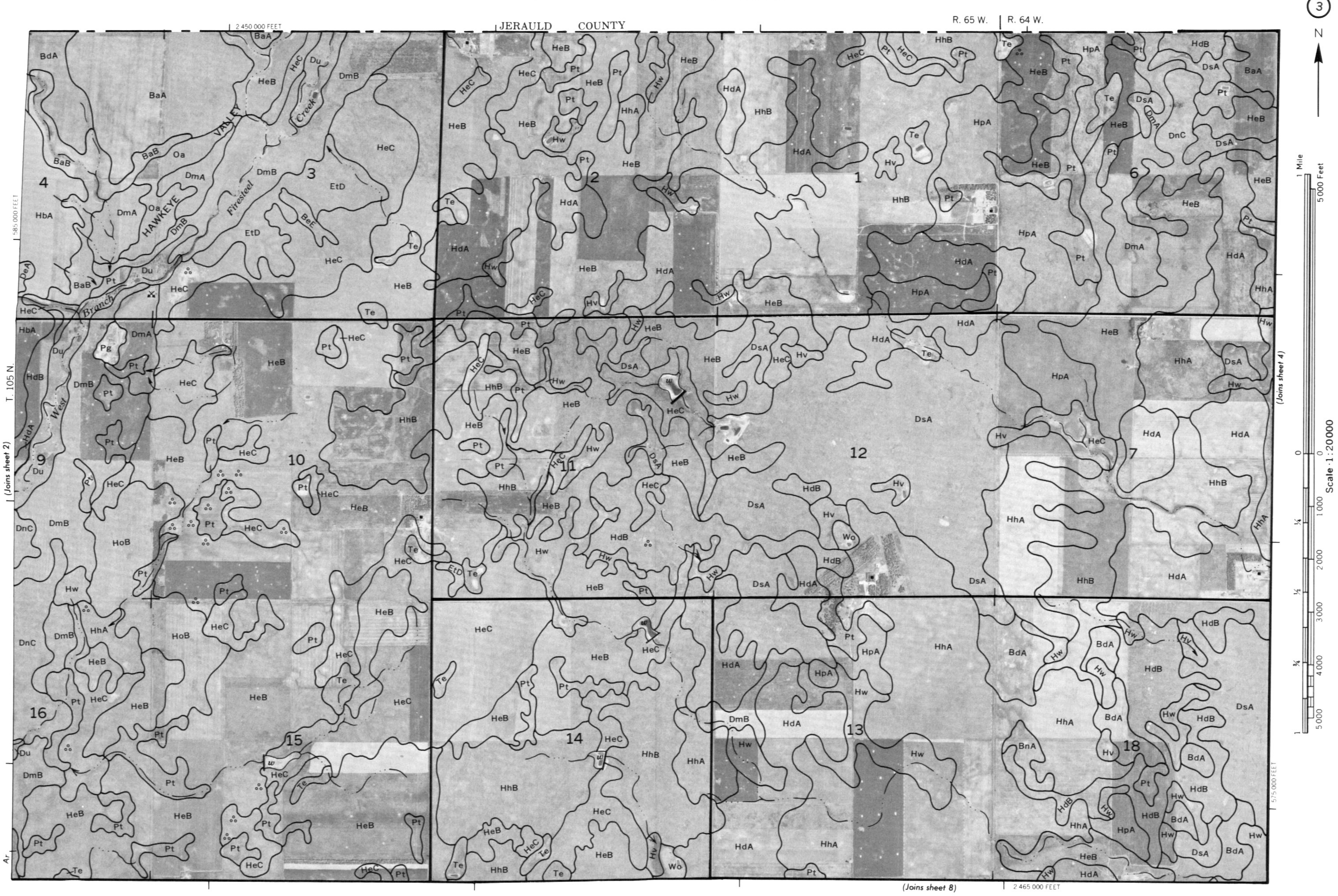

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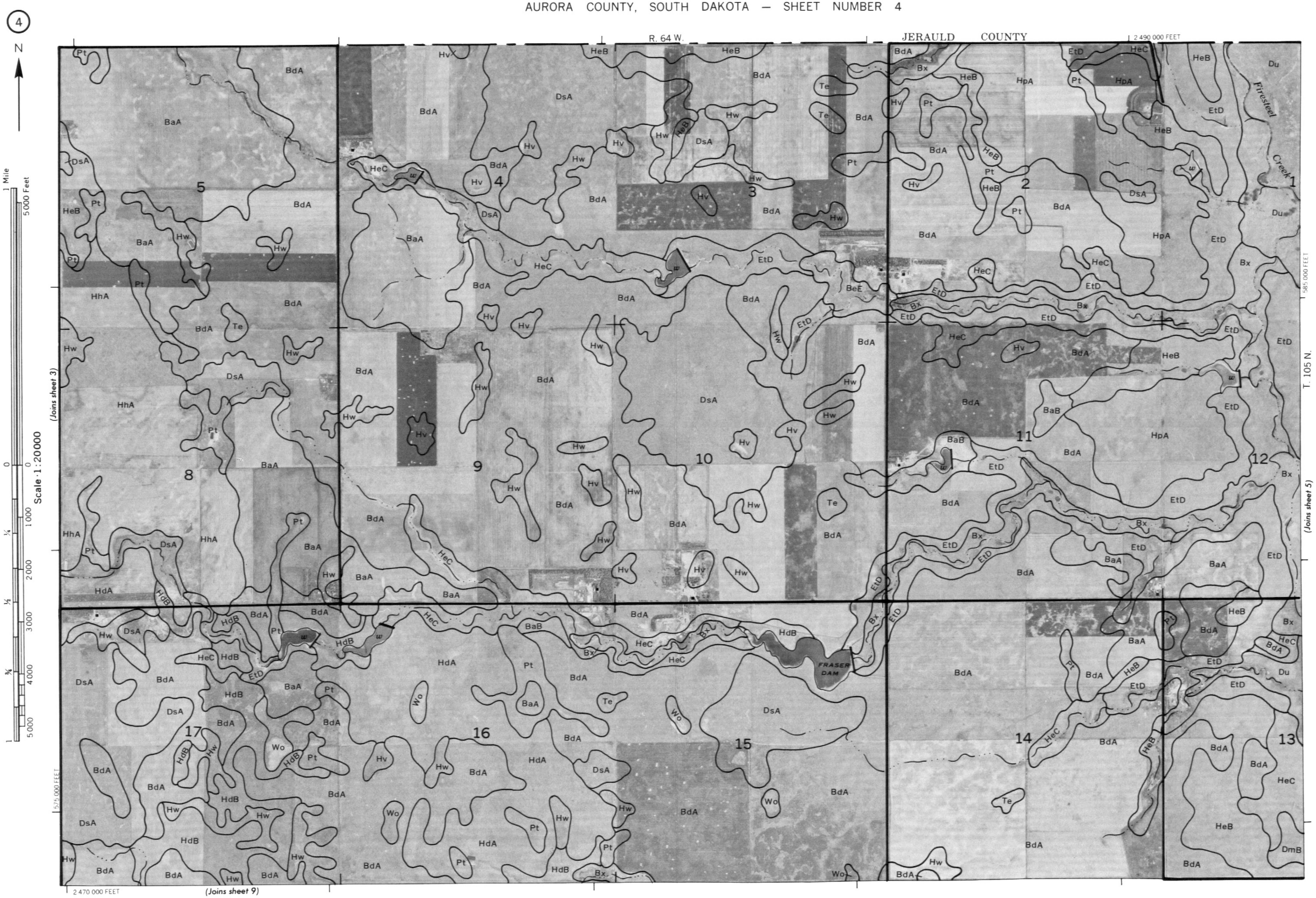

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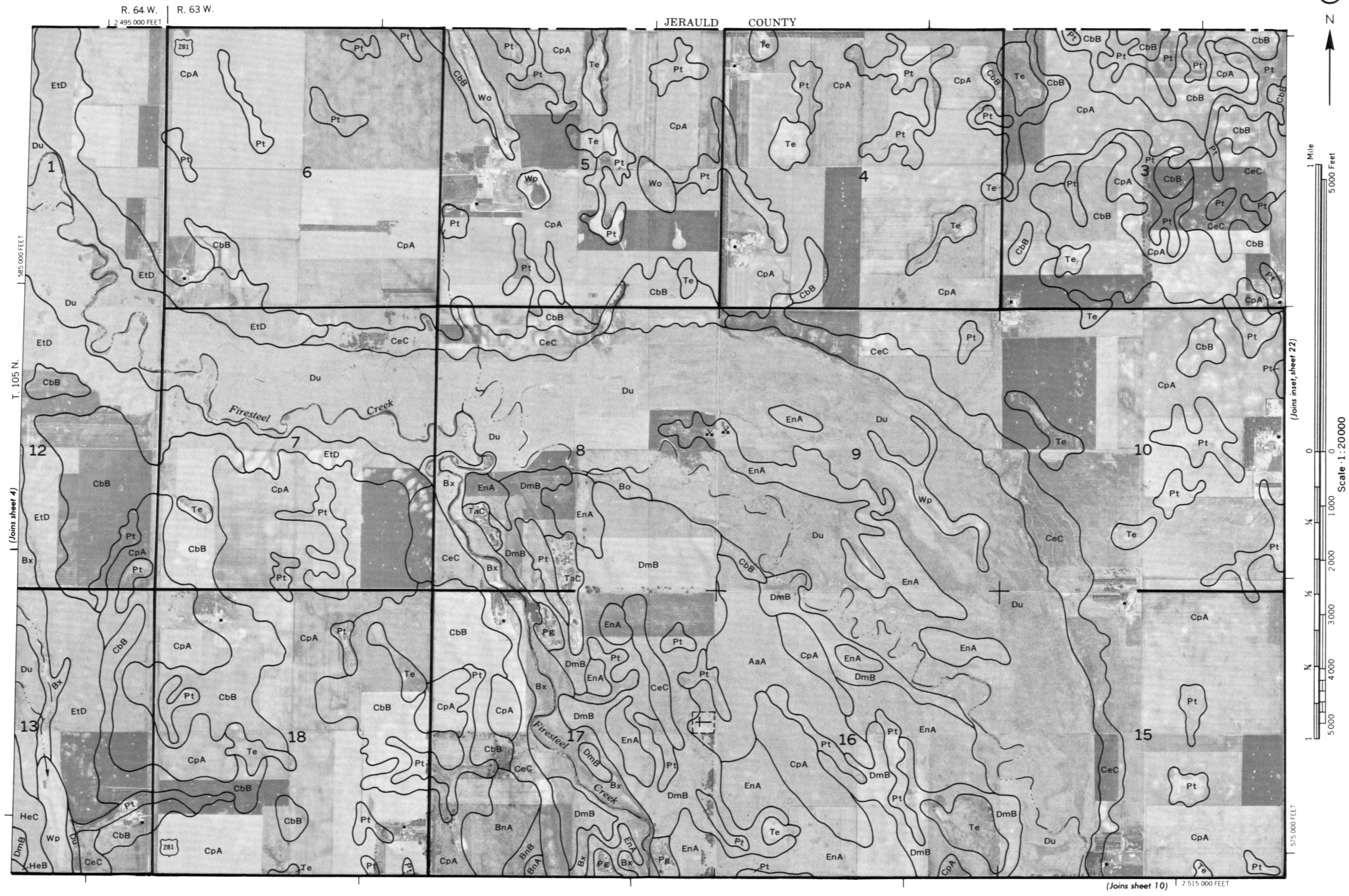

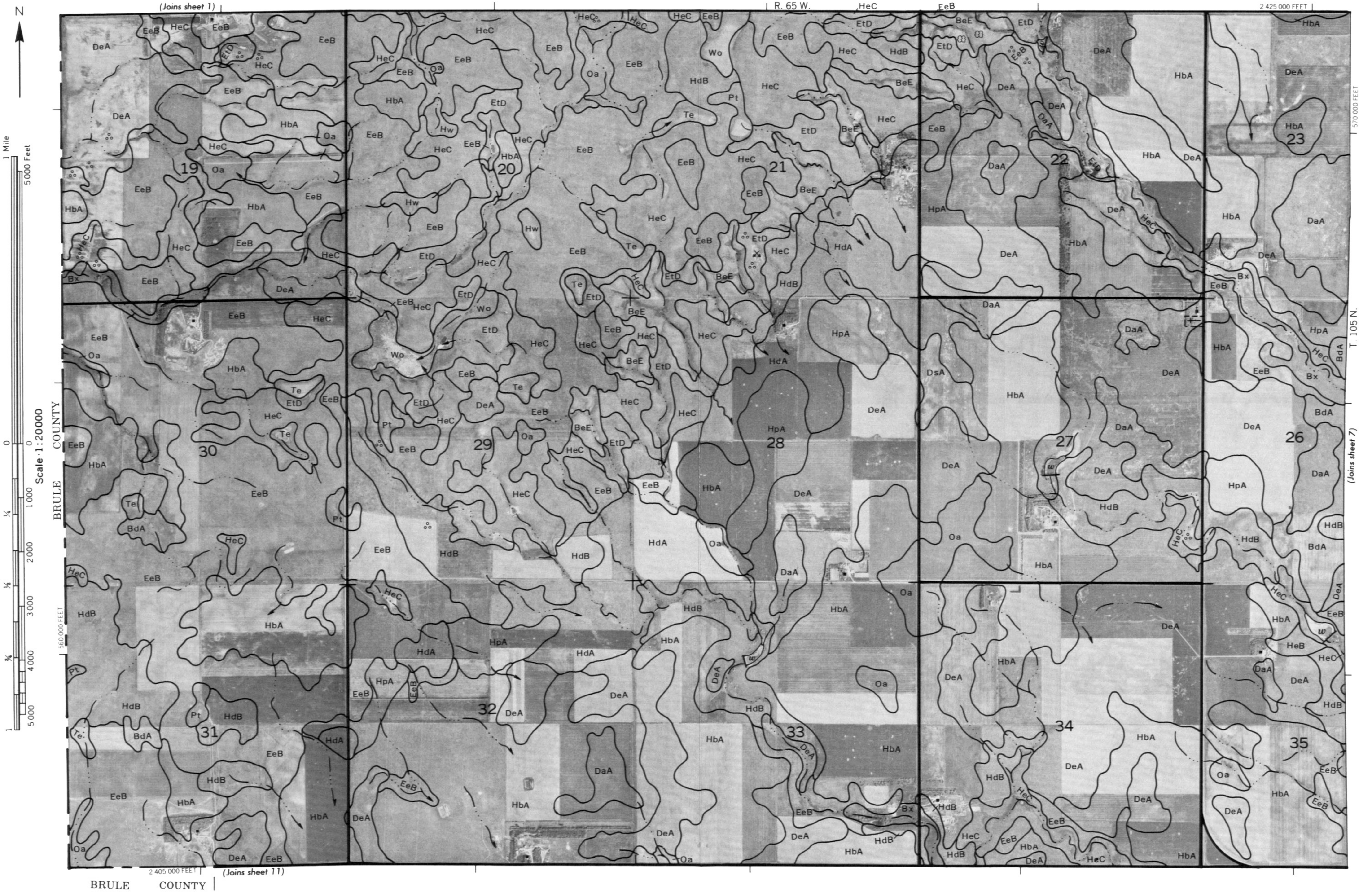
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T. 105 N.
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2 405 000 FEET
(Joins sheet 11)
BRULE COUNTY
BRULE COUNTY
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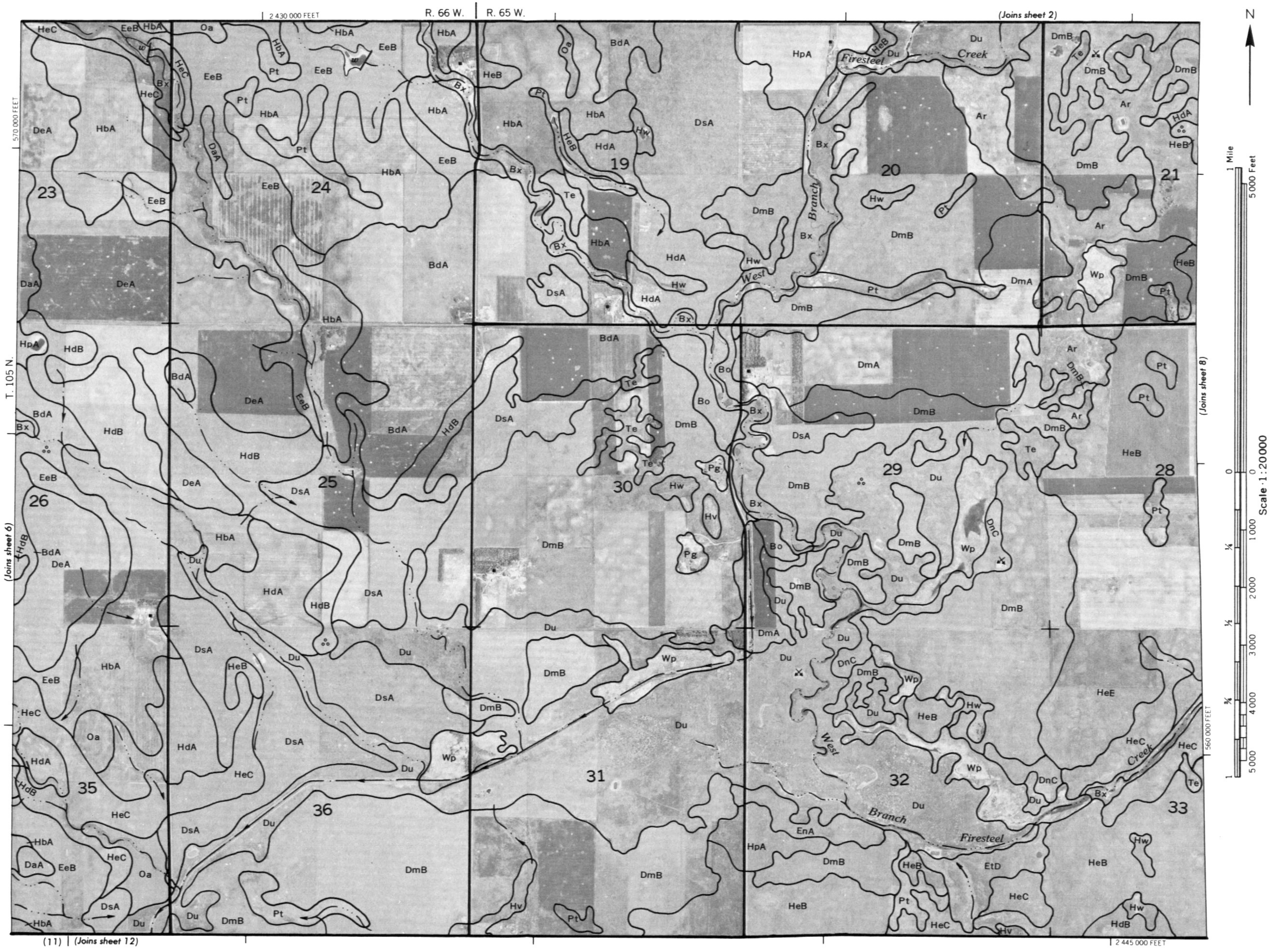

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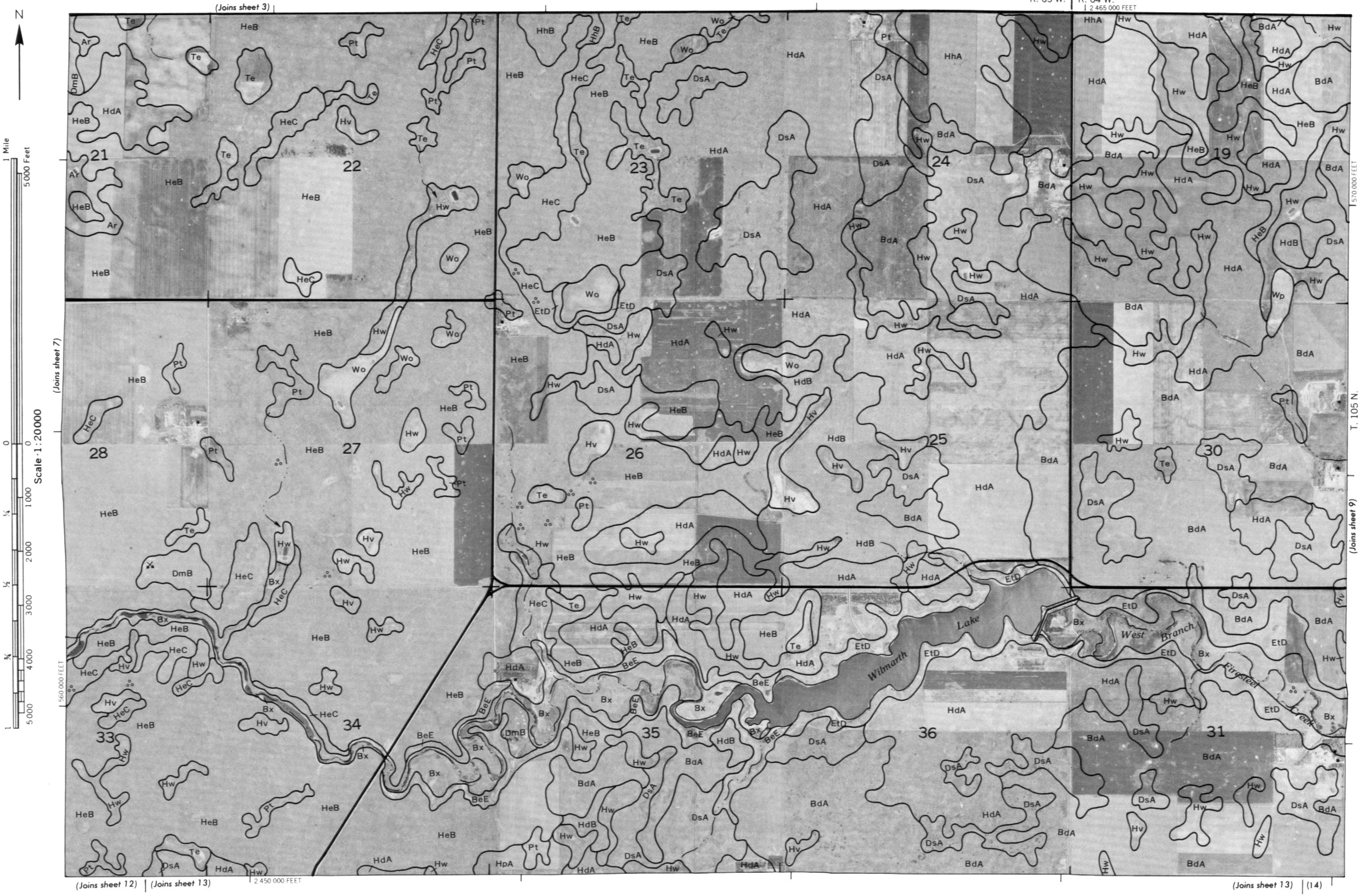

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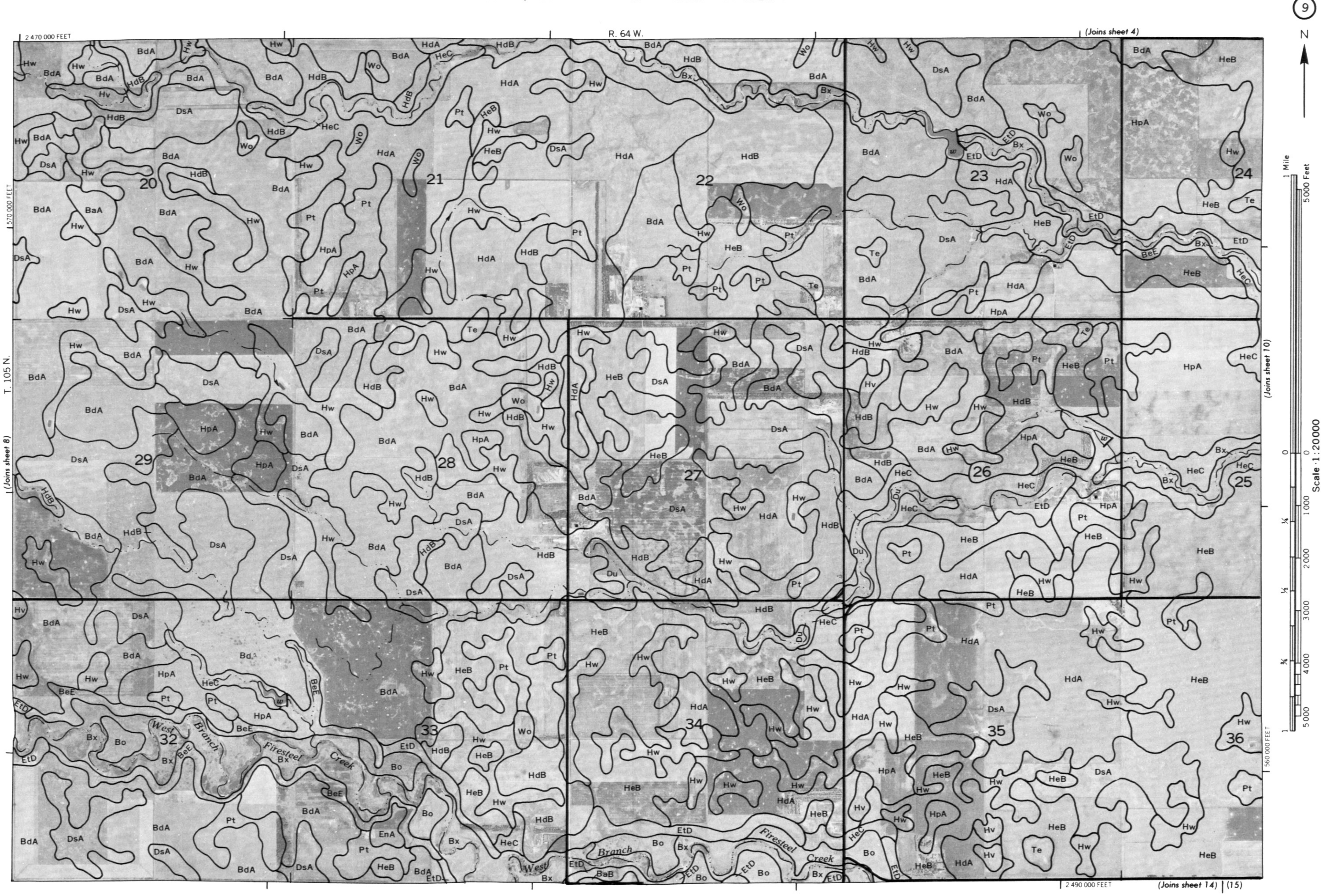

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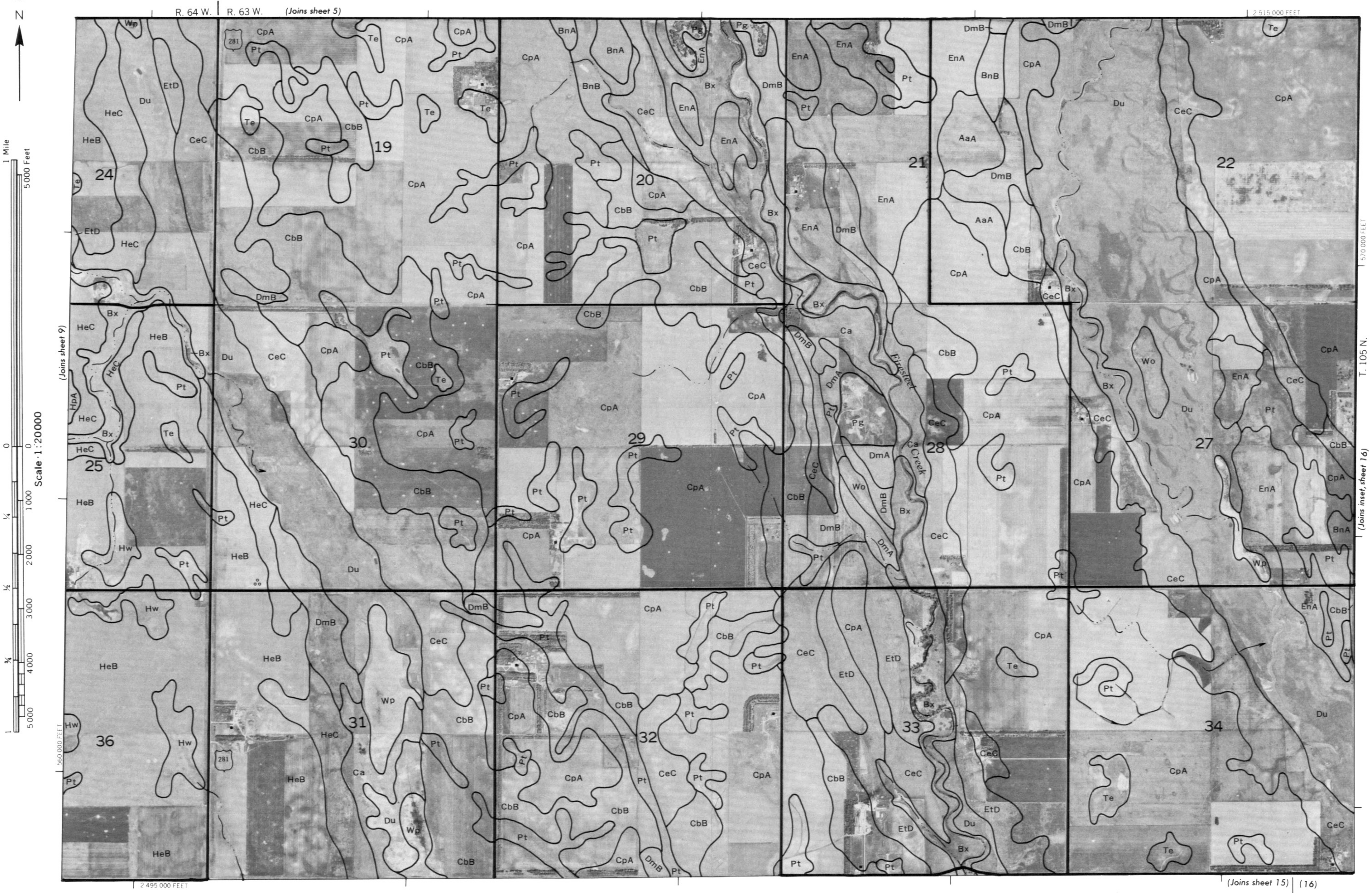

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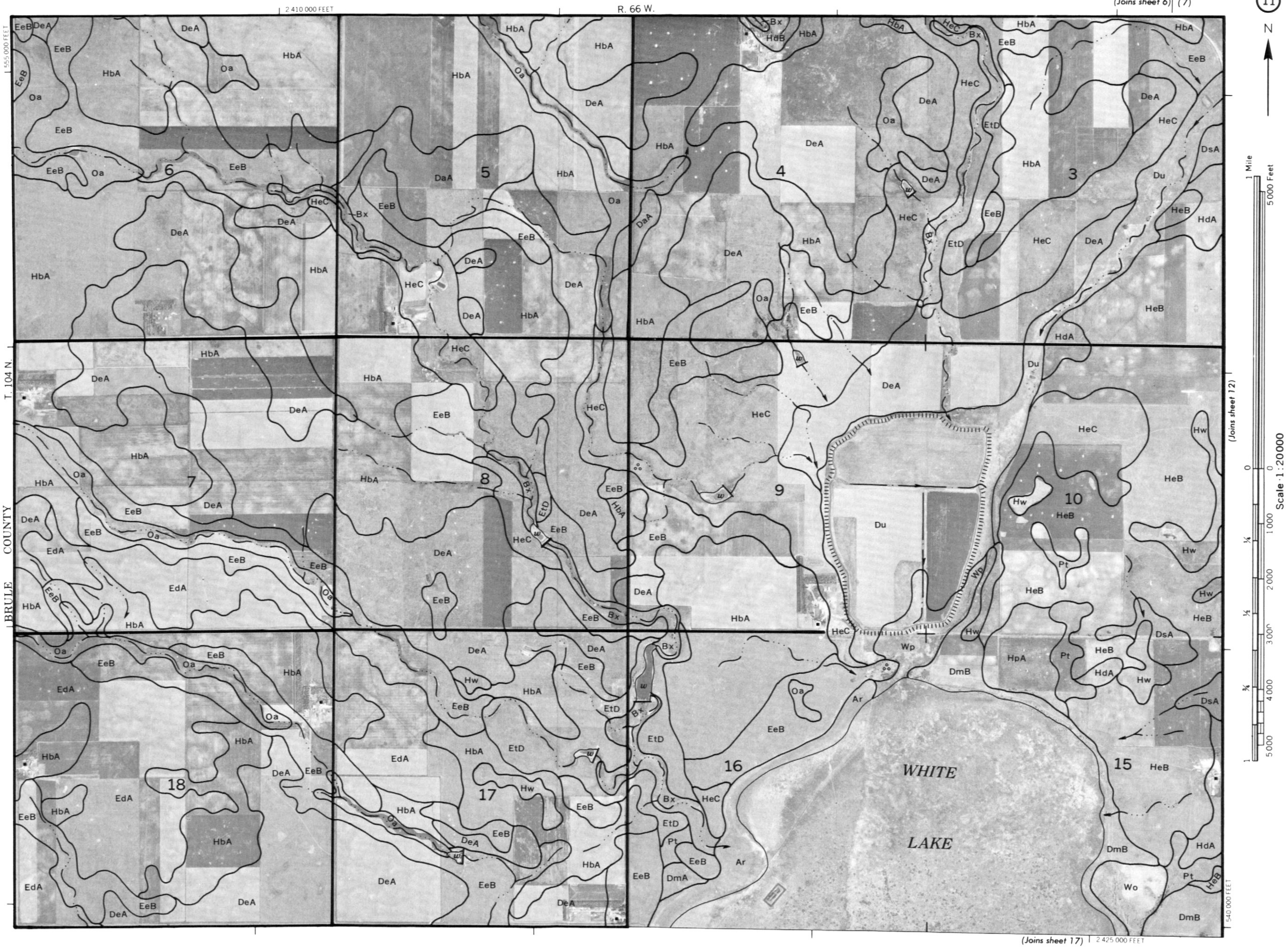

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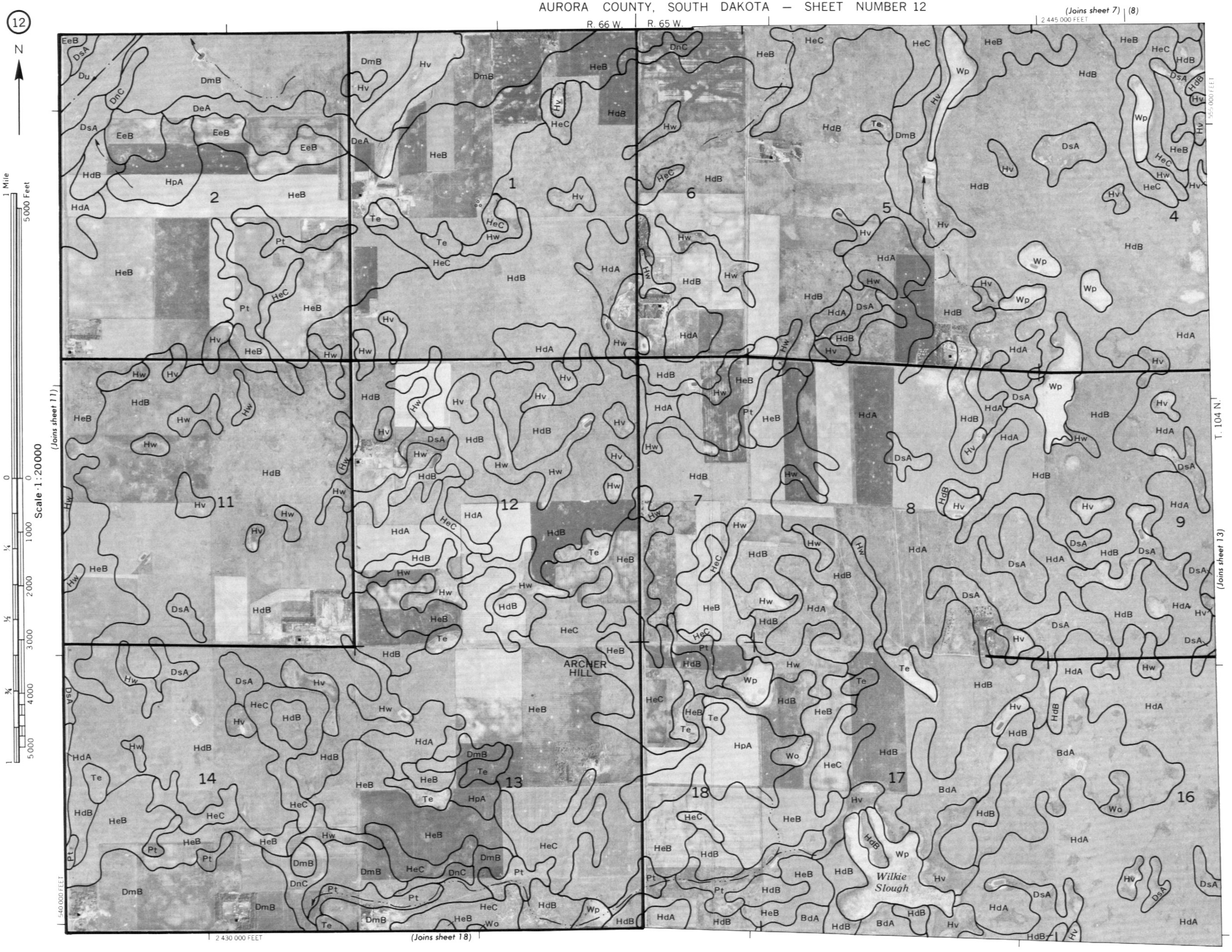

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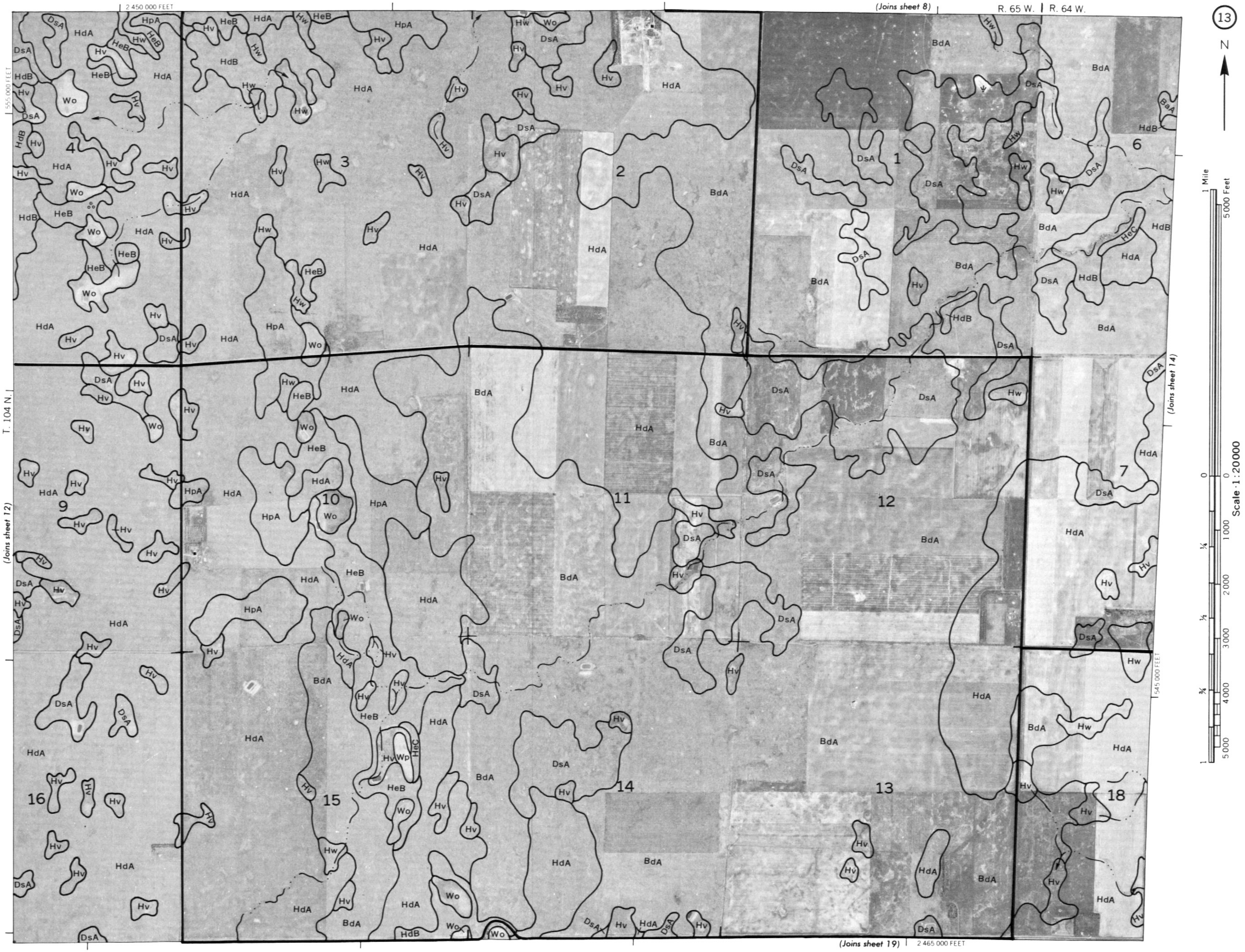

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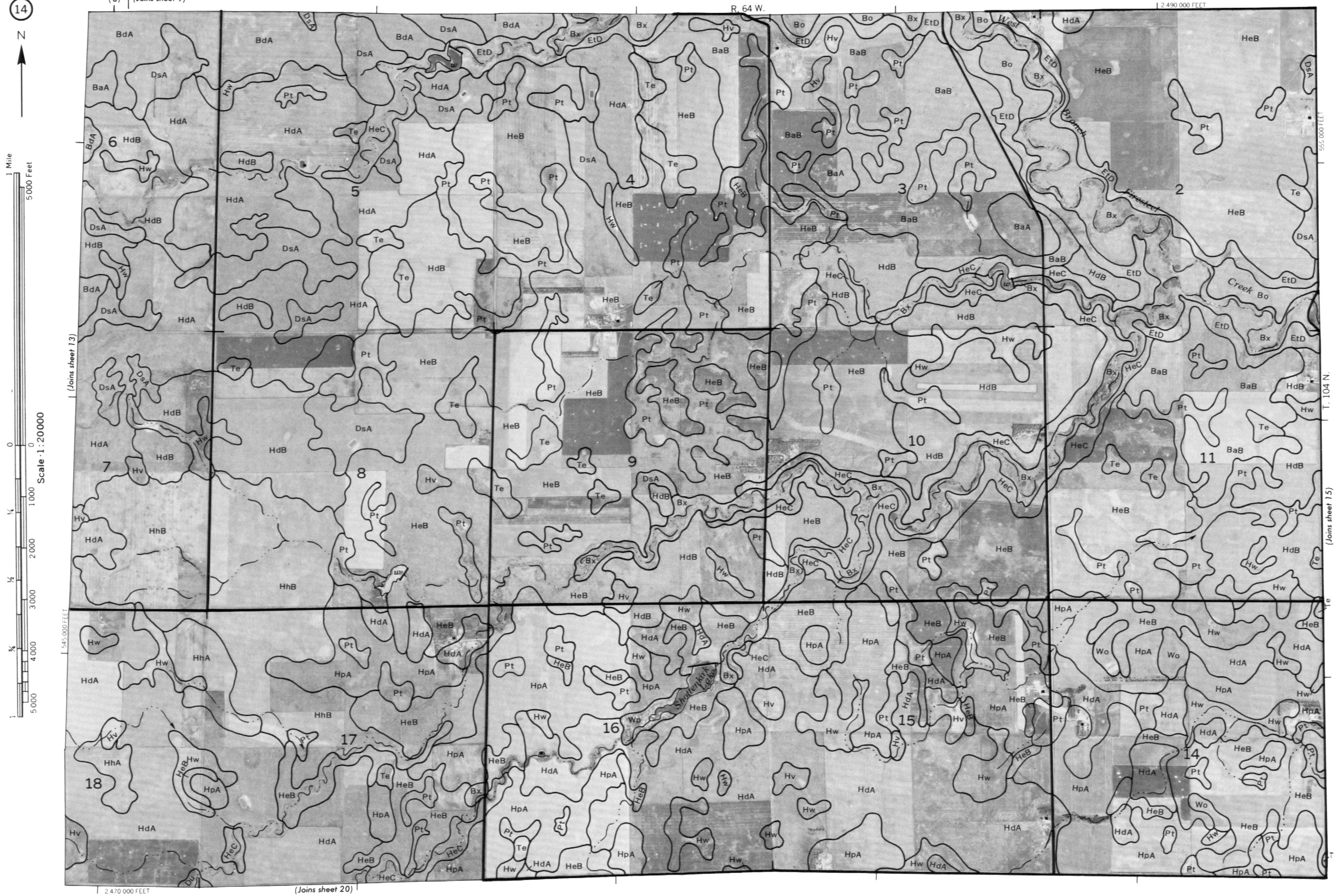

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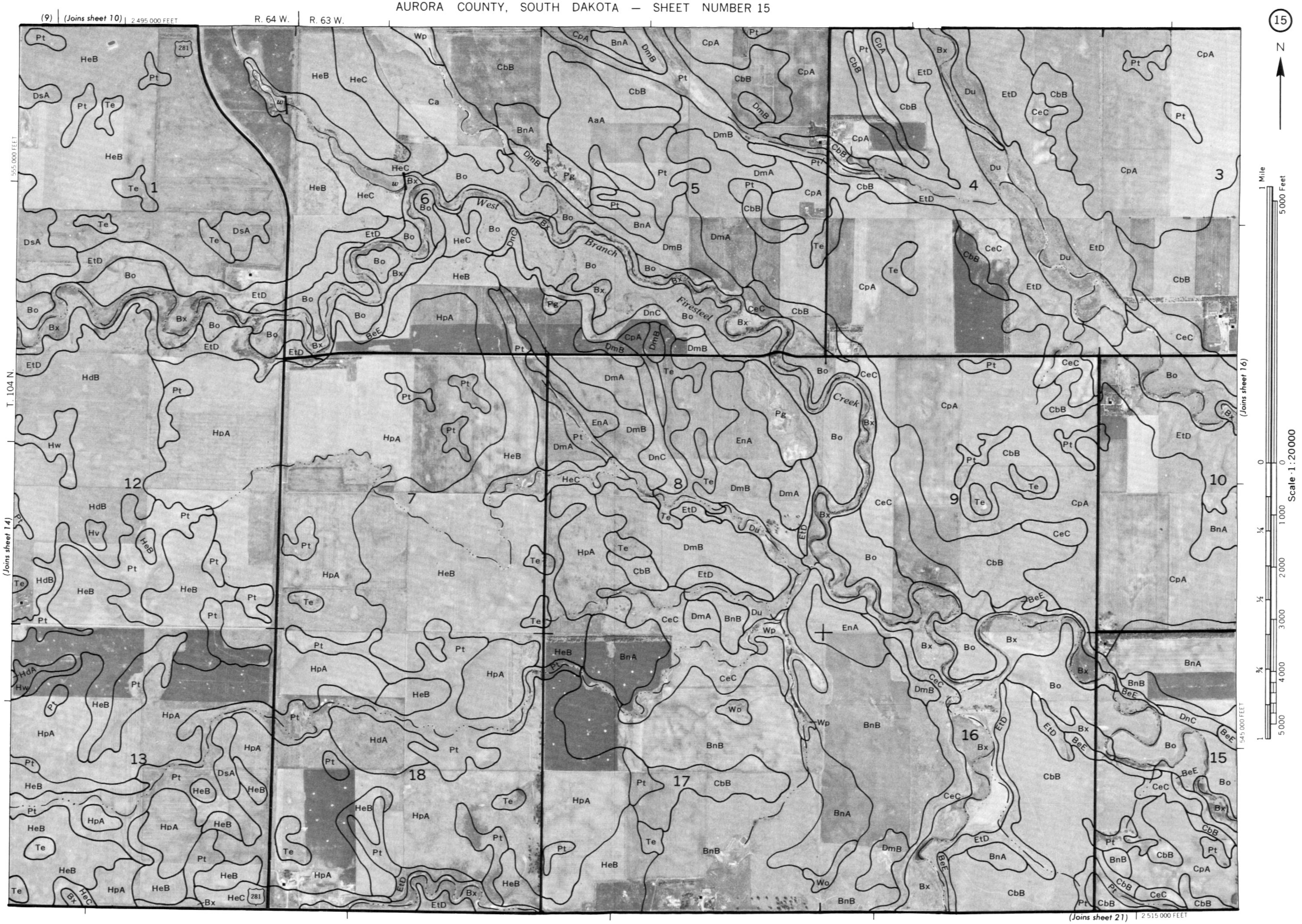

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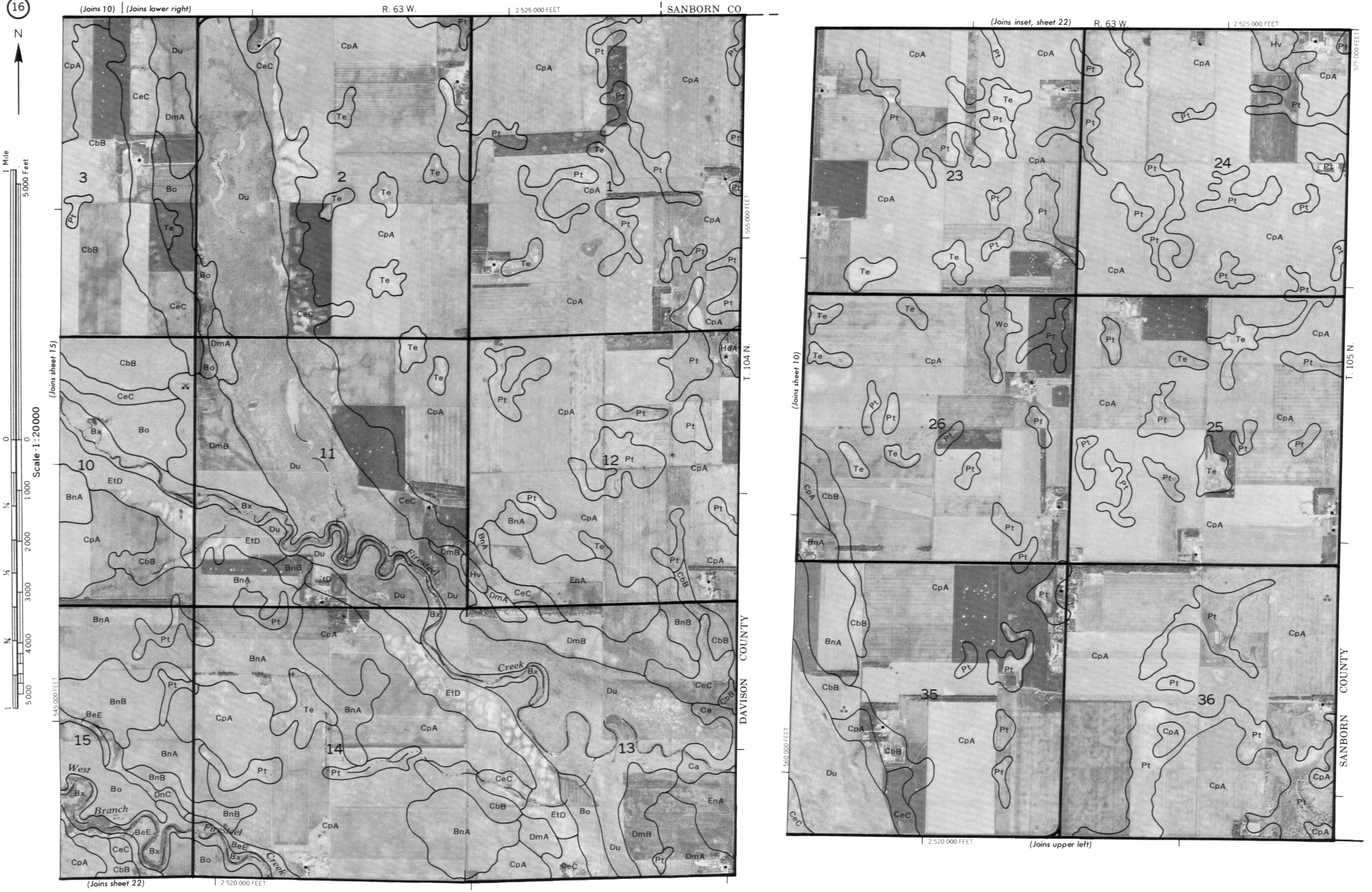

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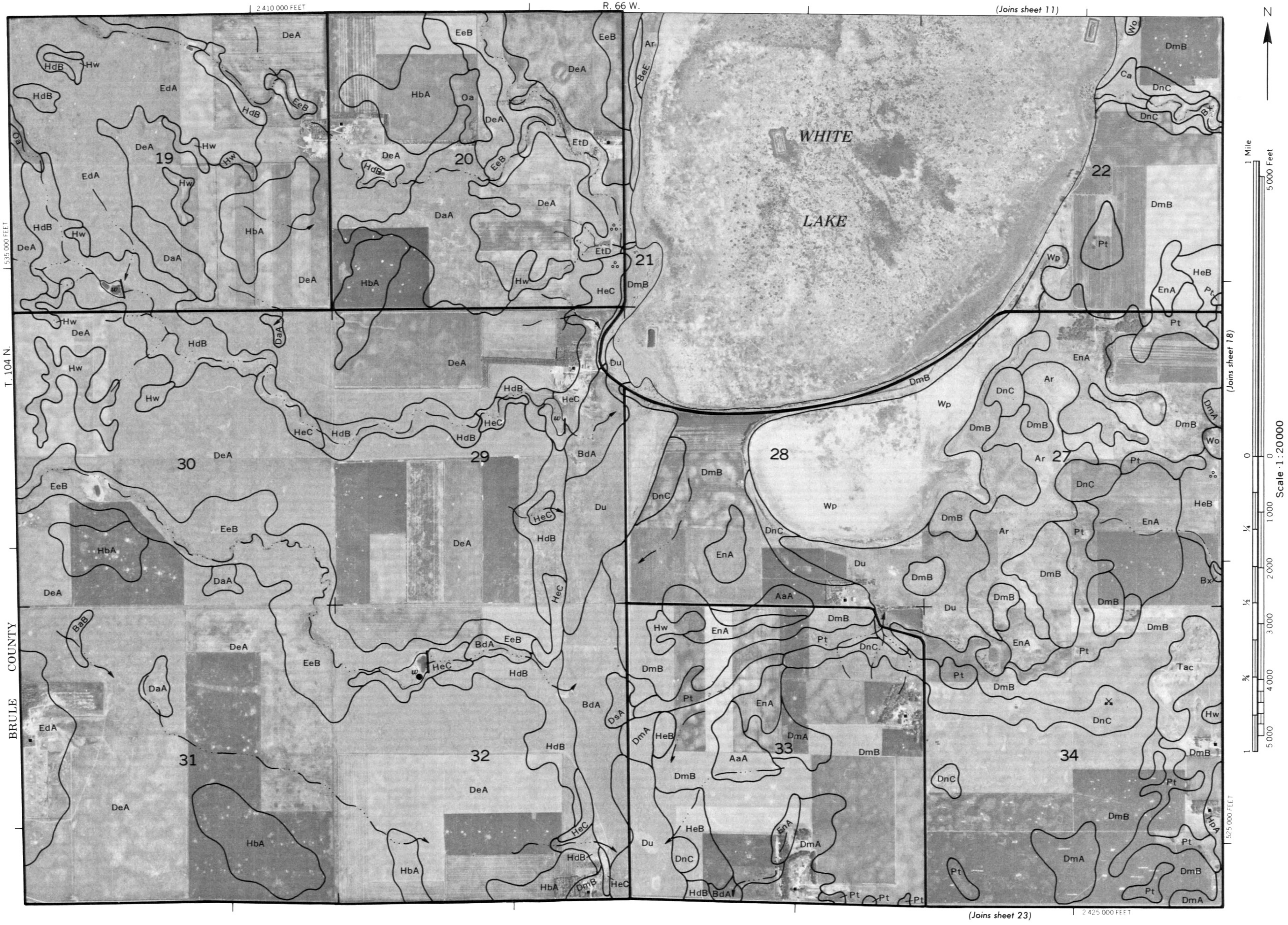

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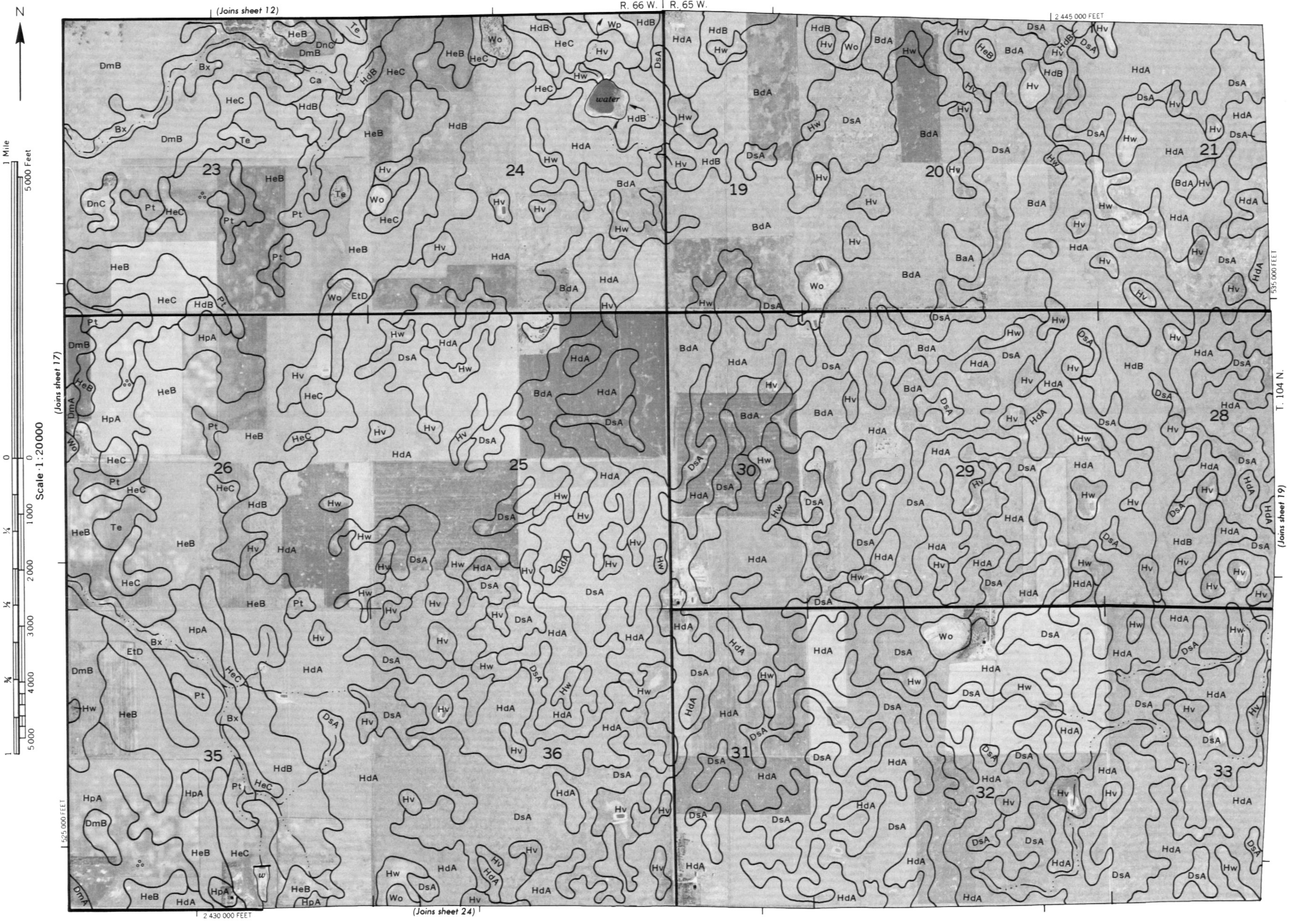

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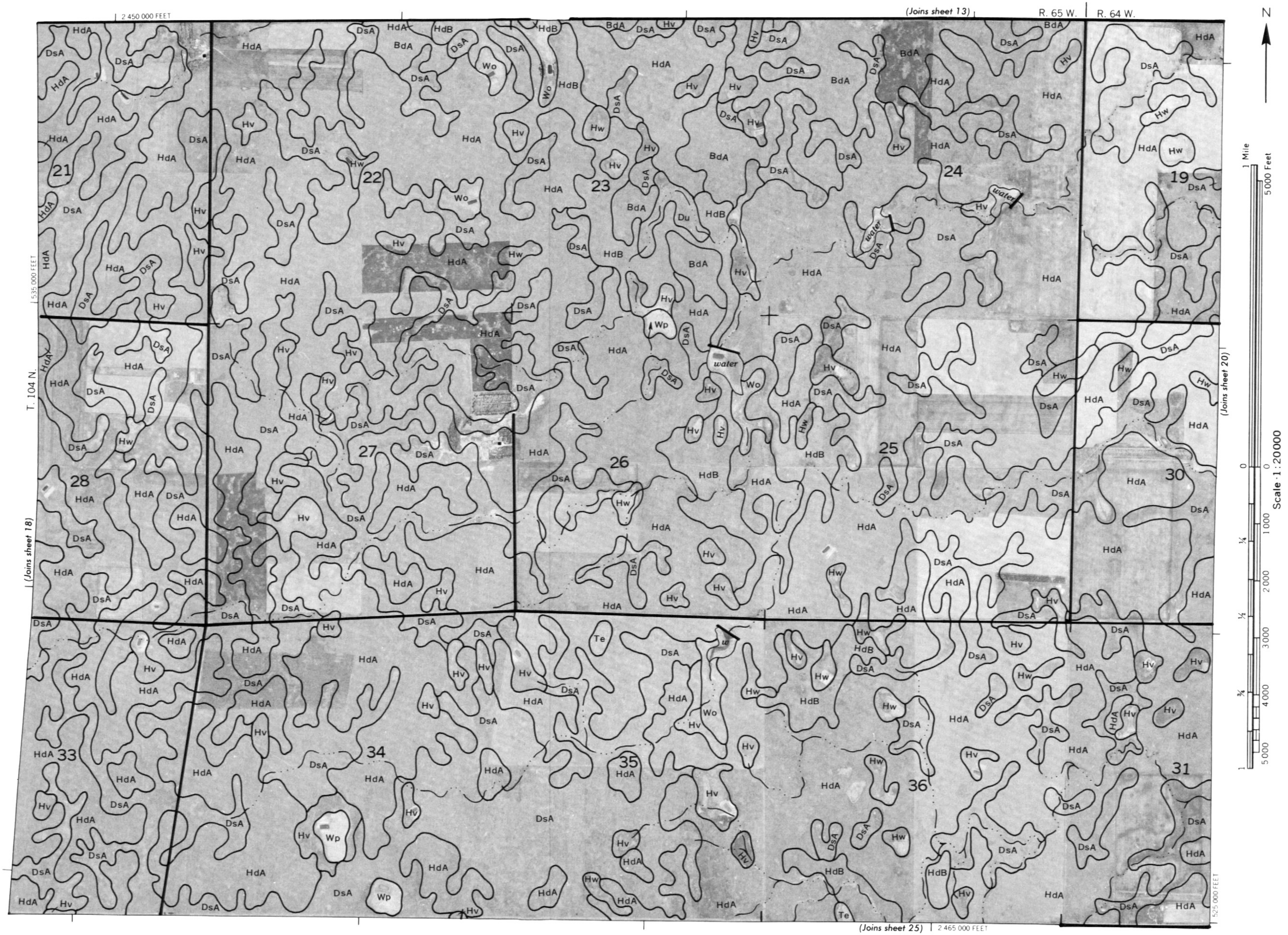

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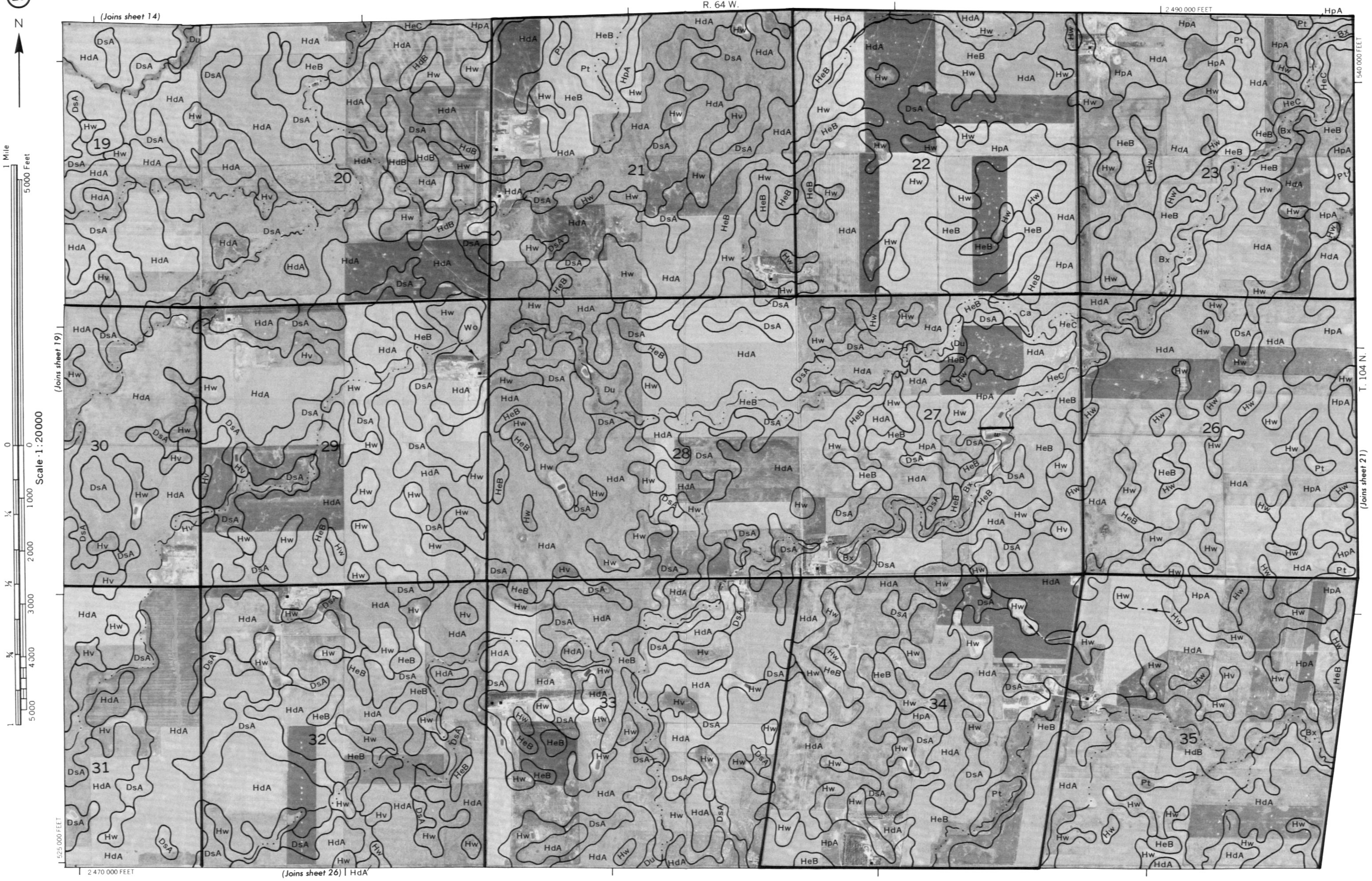

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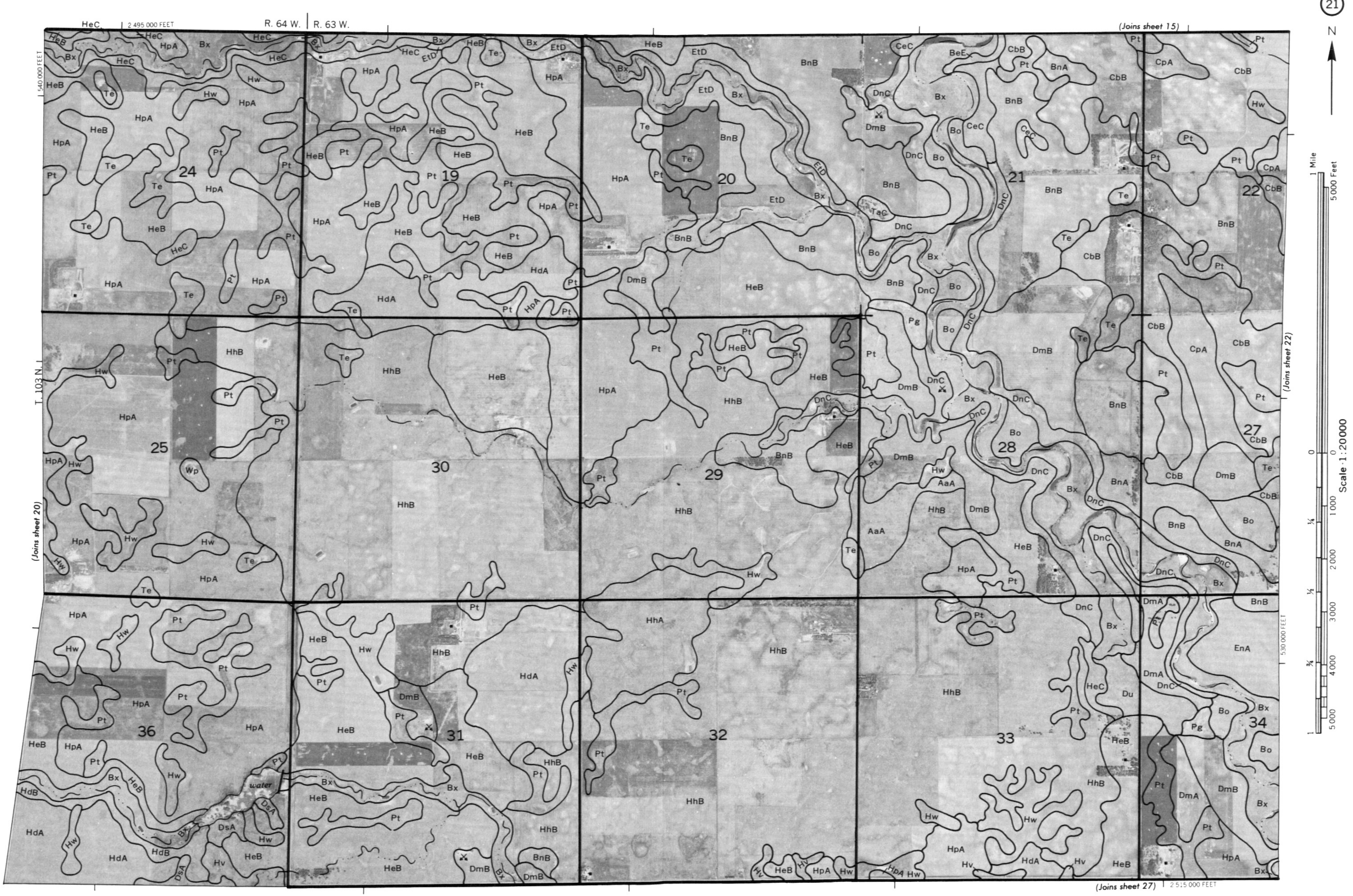

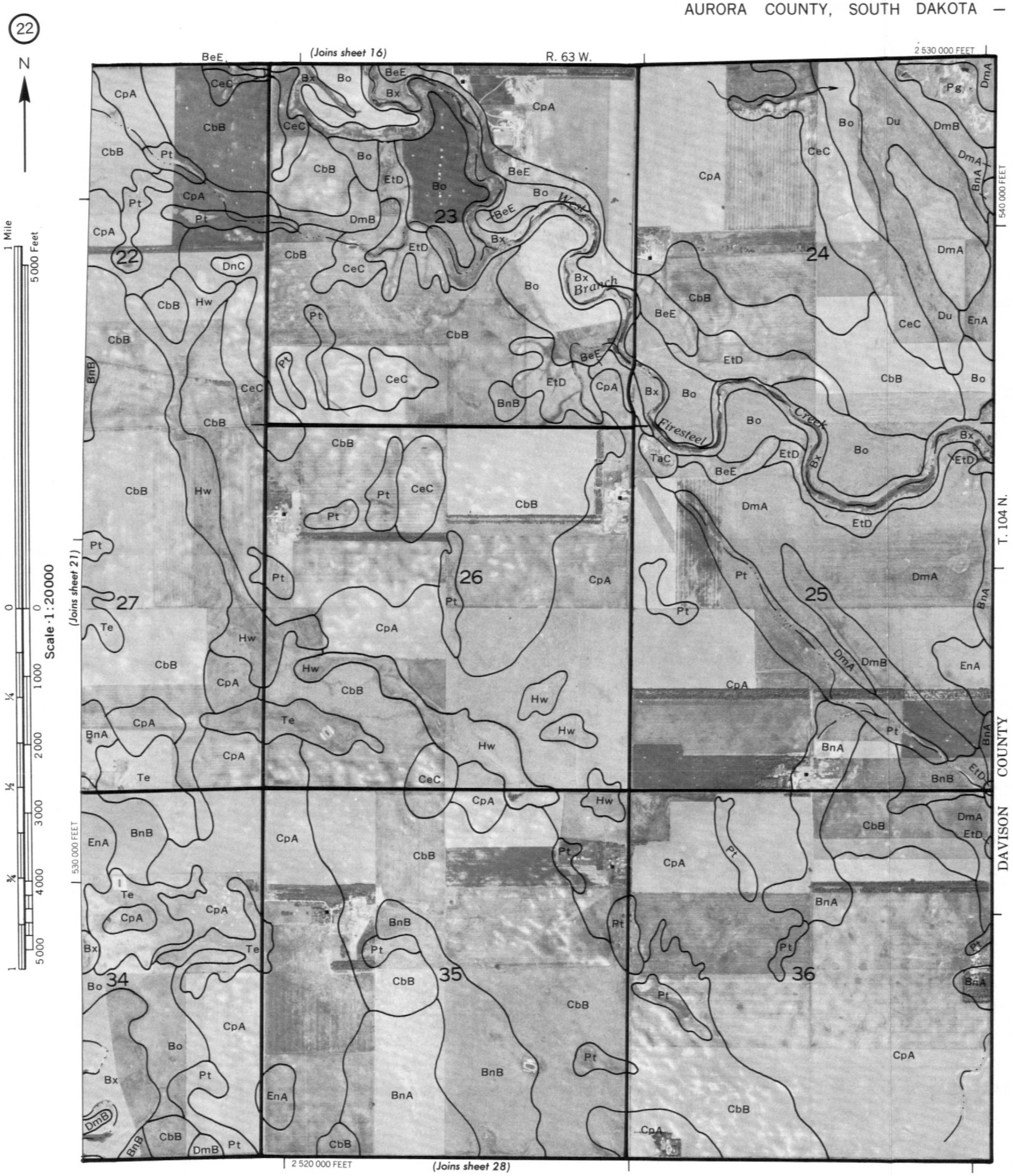
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N
1 Mile
5000 Feet
Scale 1:20000
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R. 63 W.
2 530 000 FEET
540 000 FEET
(Joins sheet 21)
530 000 FEET
2 520 000 FEET
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T. 104 N.
DAVISON COUNTY
West Branch
Firesteel Creek
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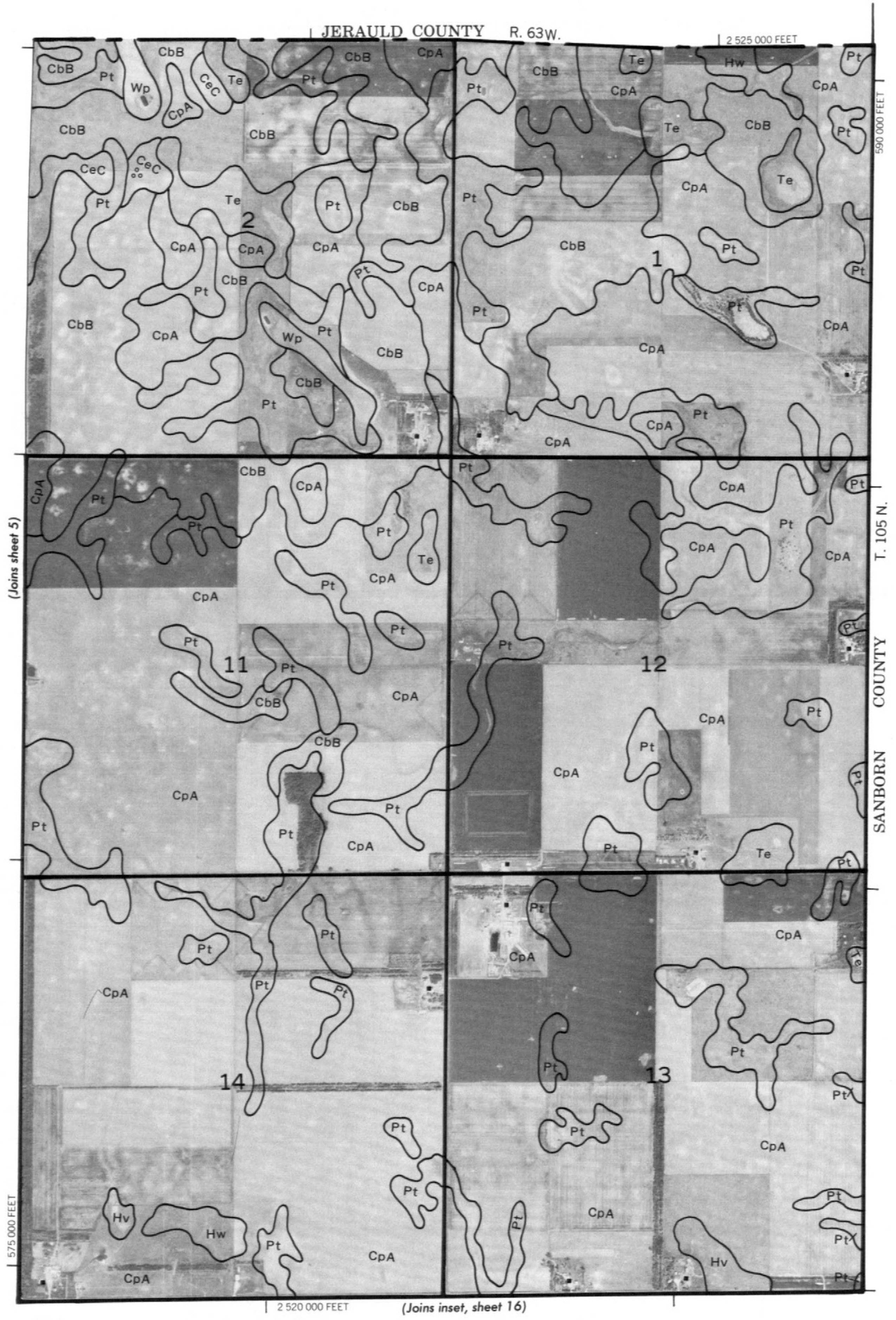
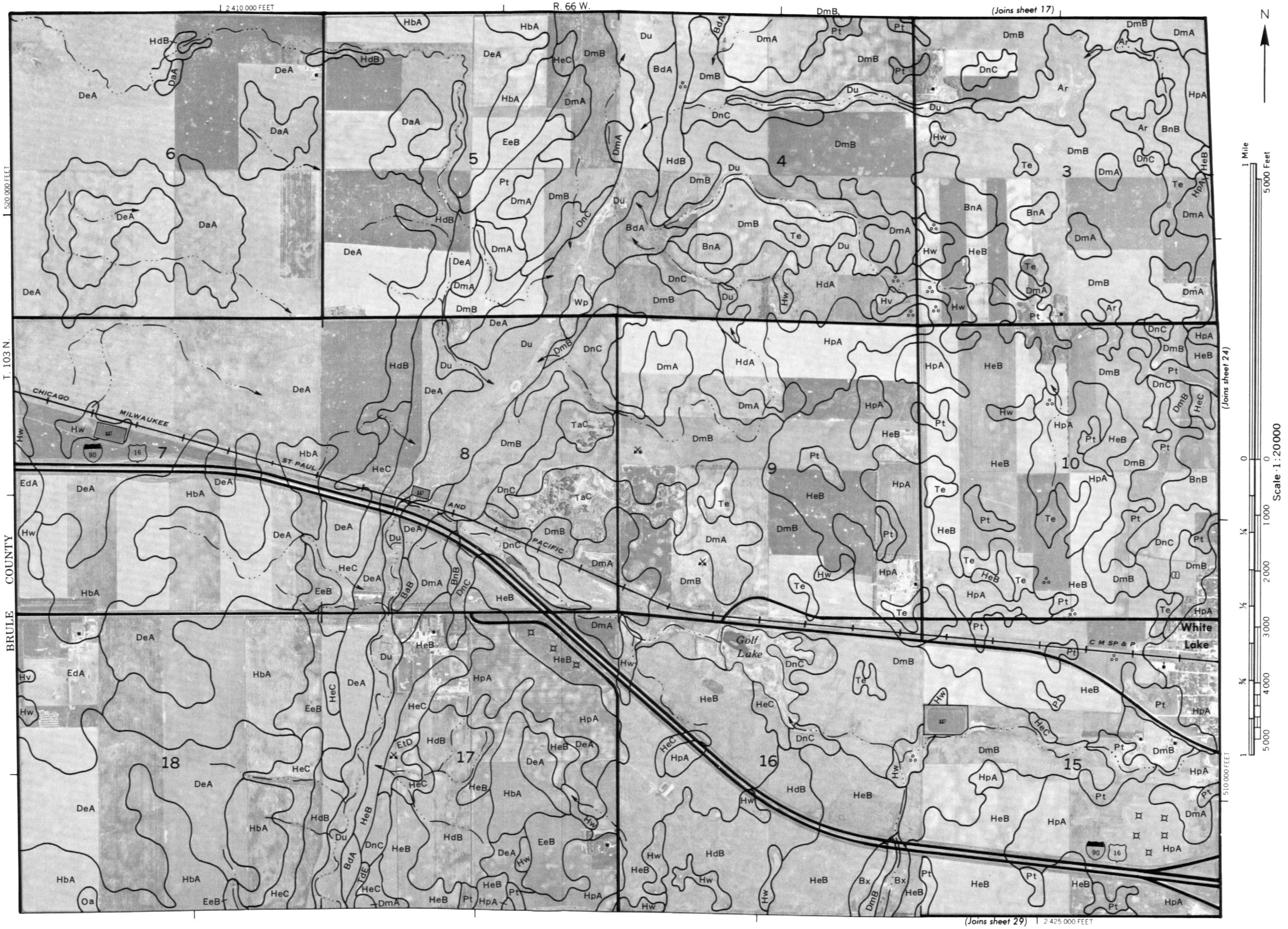
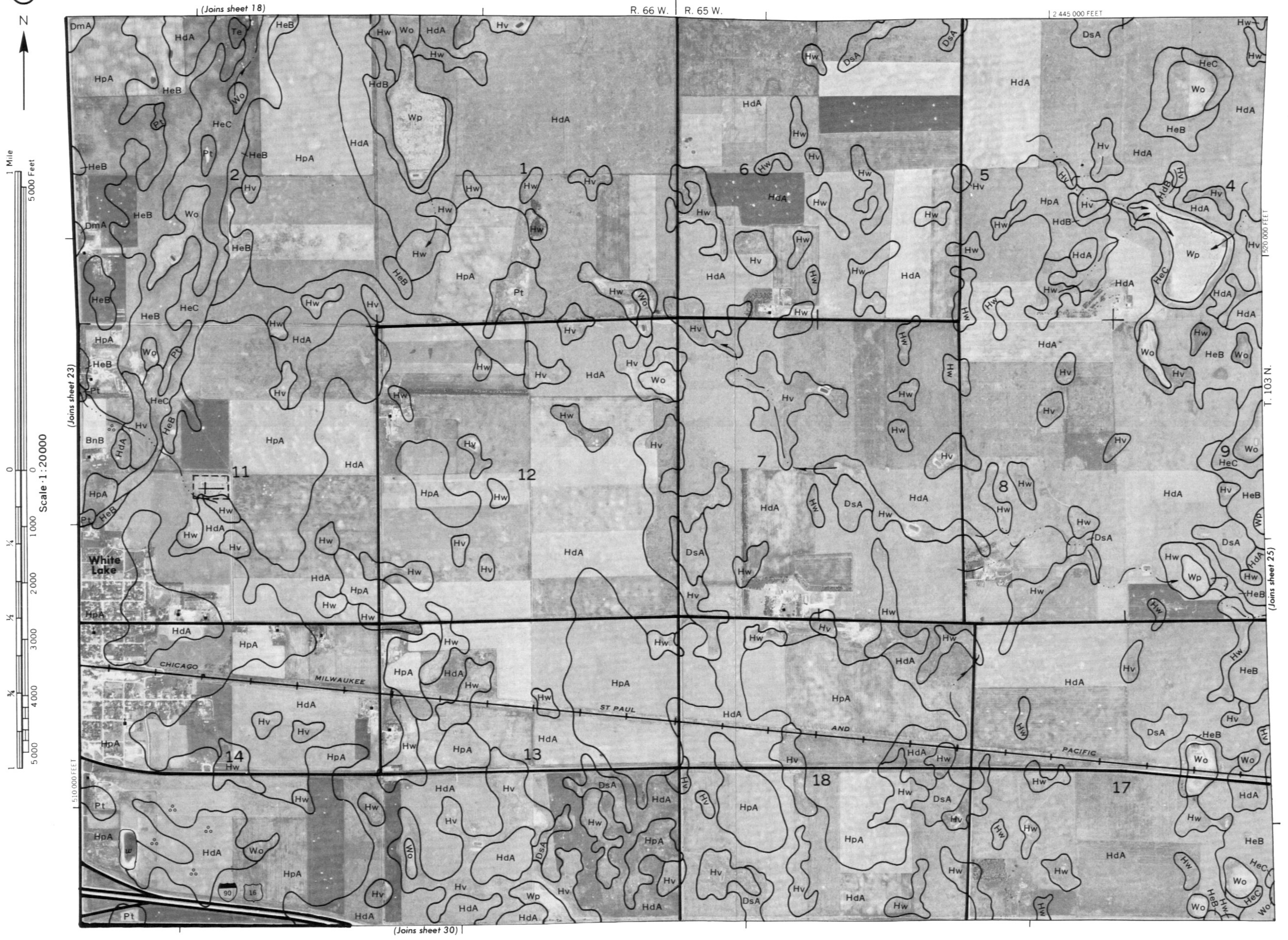
36

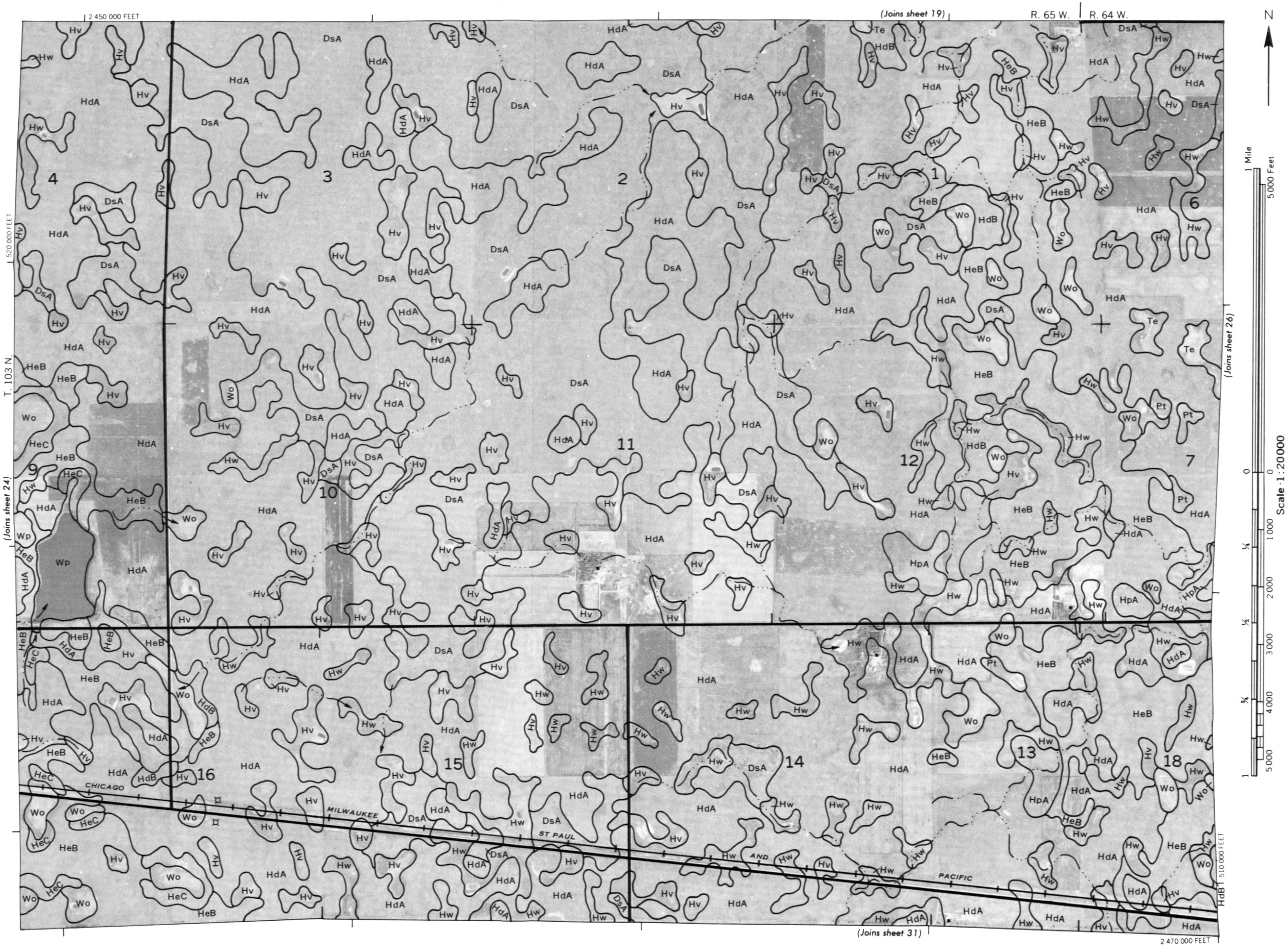

JERAULD COUNTY
R. 63 W.
2 525 000 FEET
590 000 FEET
(Joins sheet 5)
575 000 FEET
2 520 000 FEET
(Joins inset, sheet 16)
T. 105 N.
SANBORN COUNTY
1
2
11
12
13
14

AURORA COUNTY, SOUTH DAKOTA — SHEET NUMBER 23

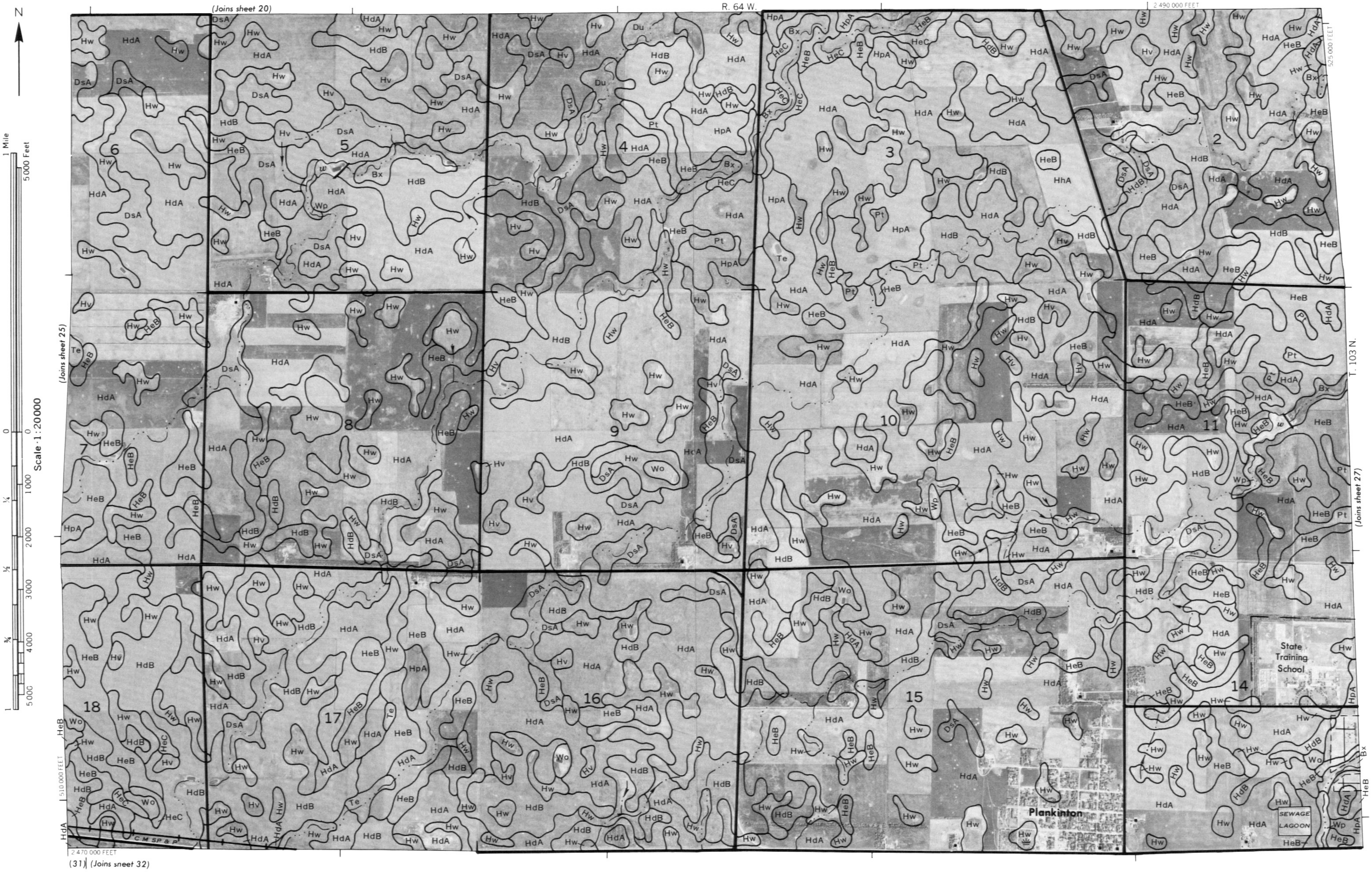


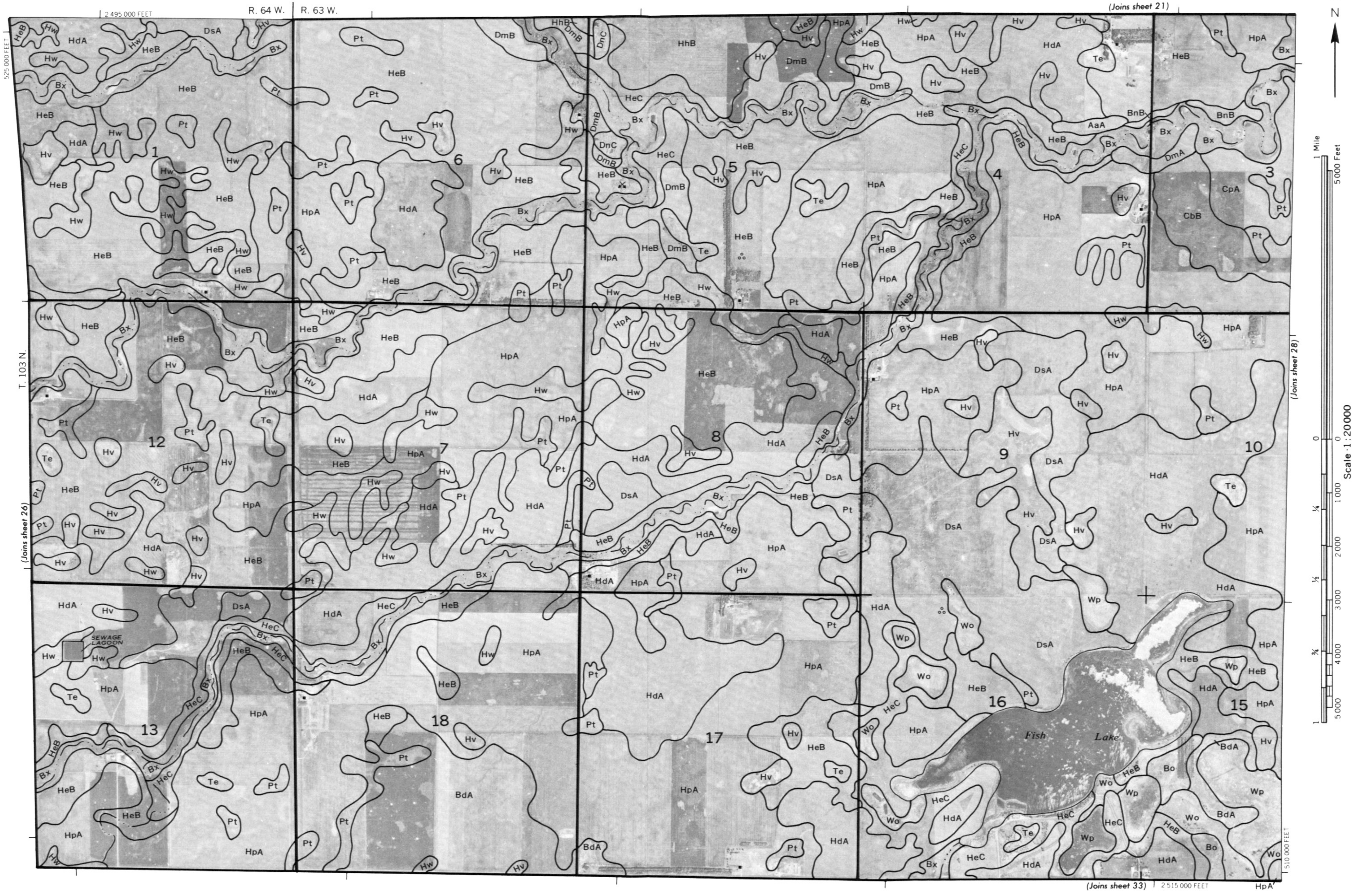

N
1 Mile
5 000 Feet
0
0
1000
¼
2000
½
3000
¾
4000
5000
1
5 000
Scale 1:20000
(Joins sheet 18)
R. 66 W.
R. 65 W.
2 445 000 FEET
520 000 FEET
T. 103 N.
(Joins sheet 23)
(Joins sheet 25)
(Joins sheet 30)
510 000 FEET
White Lake
CHICAGO
MILWAUKEE
ST PAUL
AND
PACIFIC
90
16
1
2
4
5
6
7
8
9
11
12
13
14
17
18

AURORA COUNTY, SOUTH DAKOTA — SHEET NUMBER 25

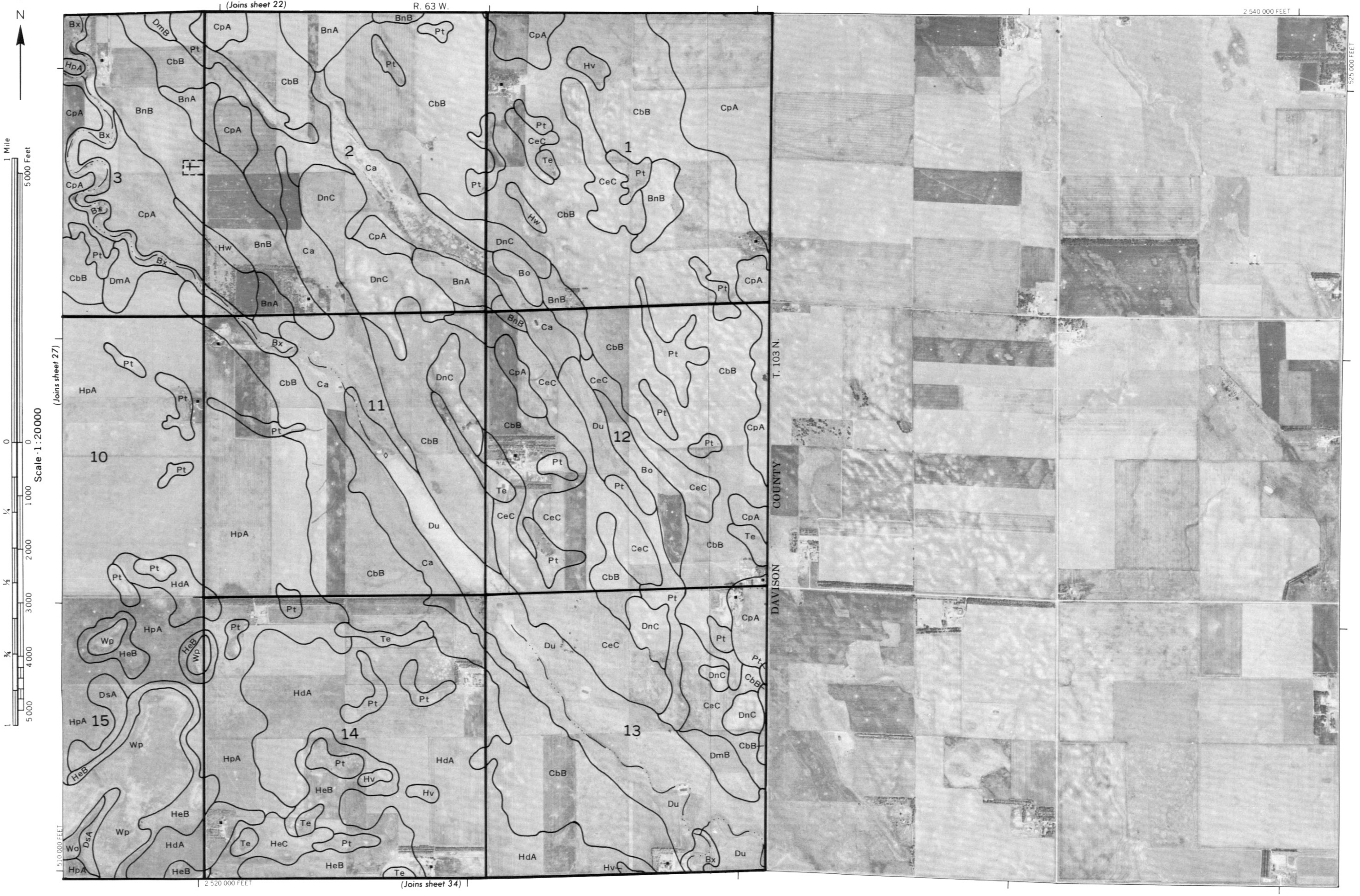


AURORA COUNTY, SOUTH DAKOTA — SHEET NUMBER 26

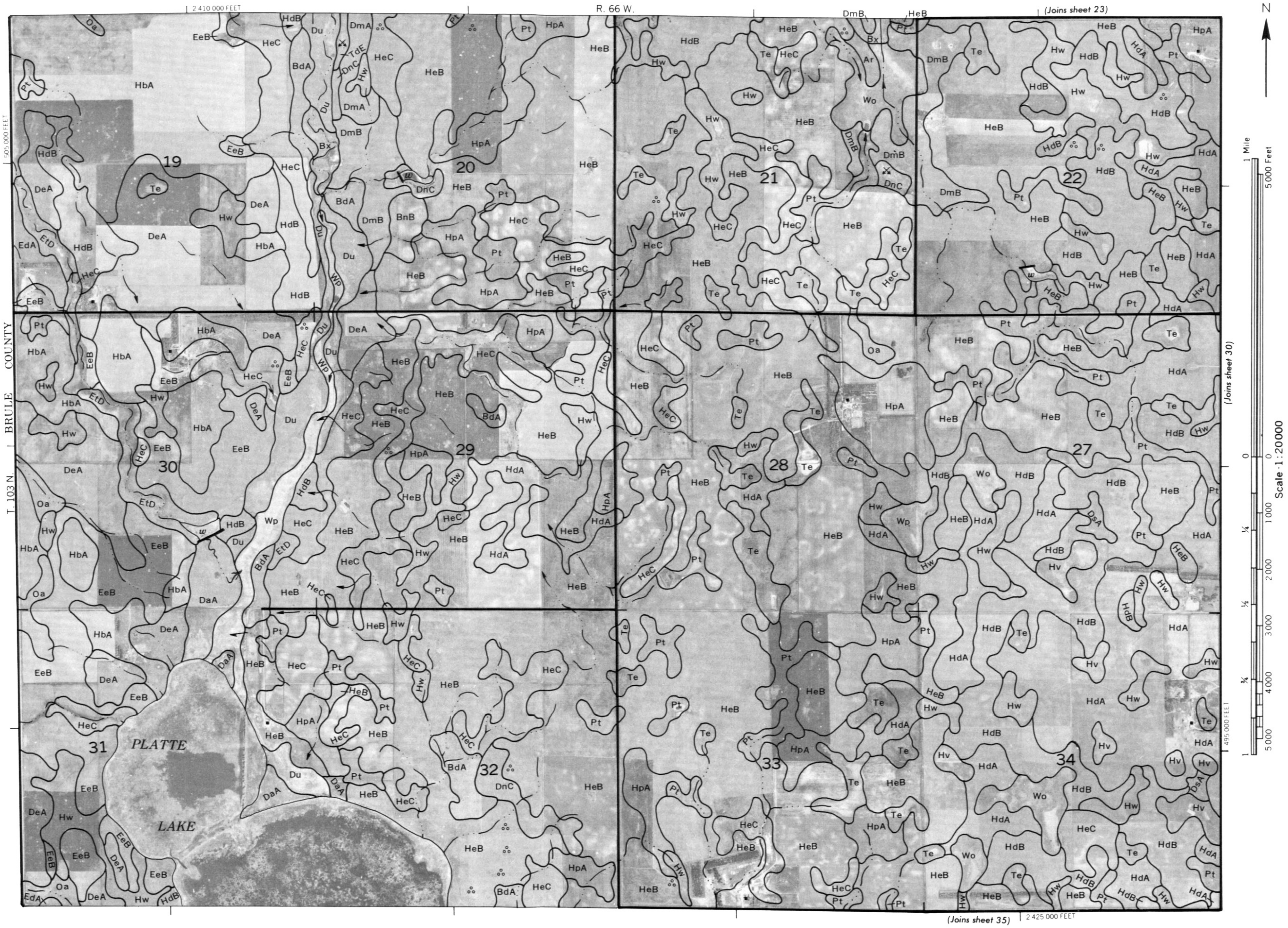



N
R. 64 W.
R. 63 W.
T. 103 N.
(Joins sheet 21)
(Joins sheet 28)
(Joins sheet 26)
(Joins sheet 33)
2 495 000 FEET
525 000 FEET
510 000 FEET
2 515 000 FEET
1 Mile
5000 Feet
Scale 1:20000
0
¼
½
¾
1
1000
2000
3000
4000
5000
1
2
3
4
5
6
7
8
9
10
12
13
15
16
17
18
SEWAGE LAGOON
Fish Lake
AaA
BdA
BnB
Bo
Bx
CbB
CpA
DmA
DmB
DnC
DsA
HdA
HeB
HeC
HhB
HpA
Hv
Hw
Pt
Te
Wo
Wp

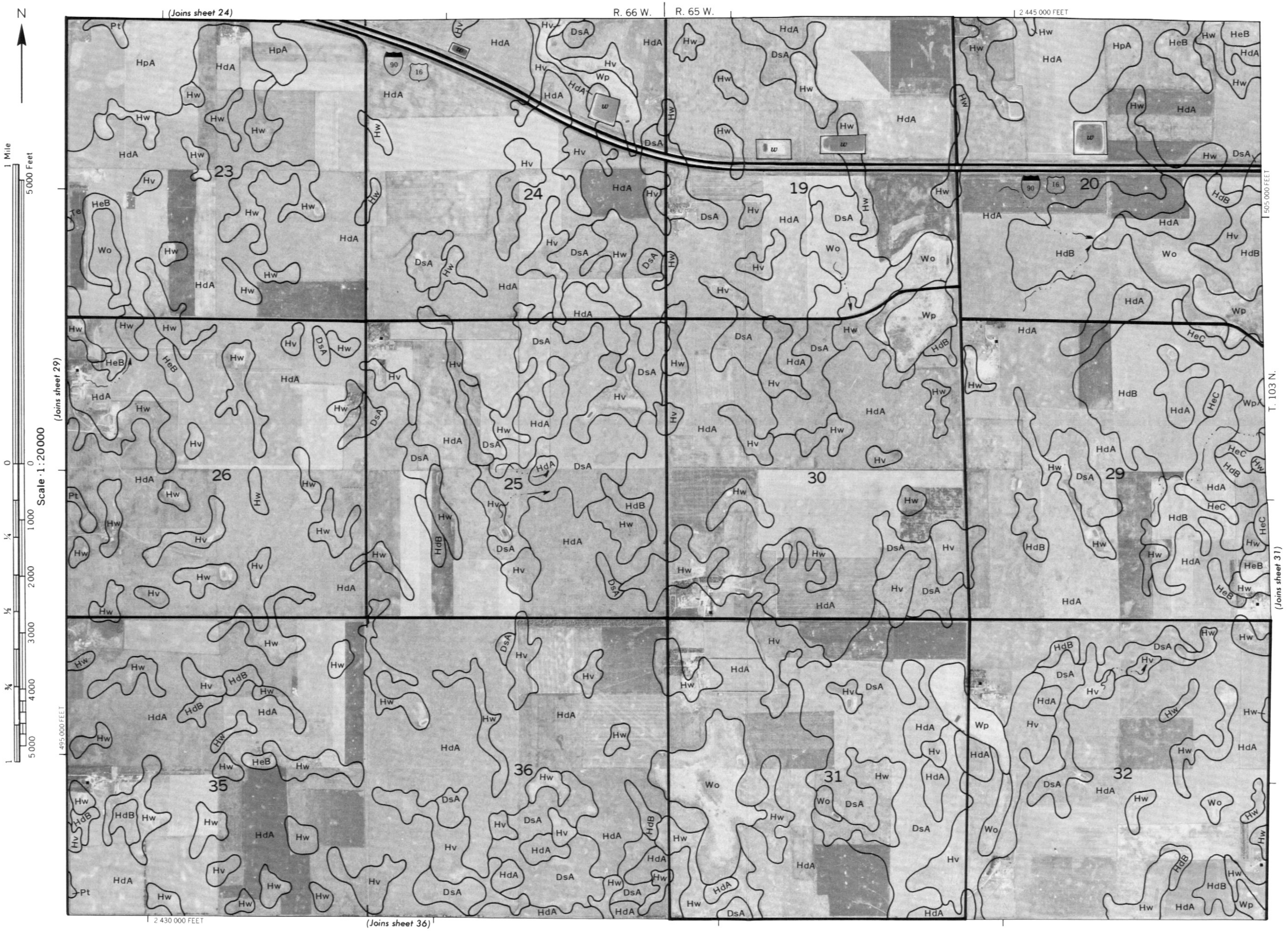
AURORA COUNTY, SOUTH DAKOTA — SHEET NUMBER 28

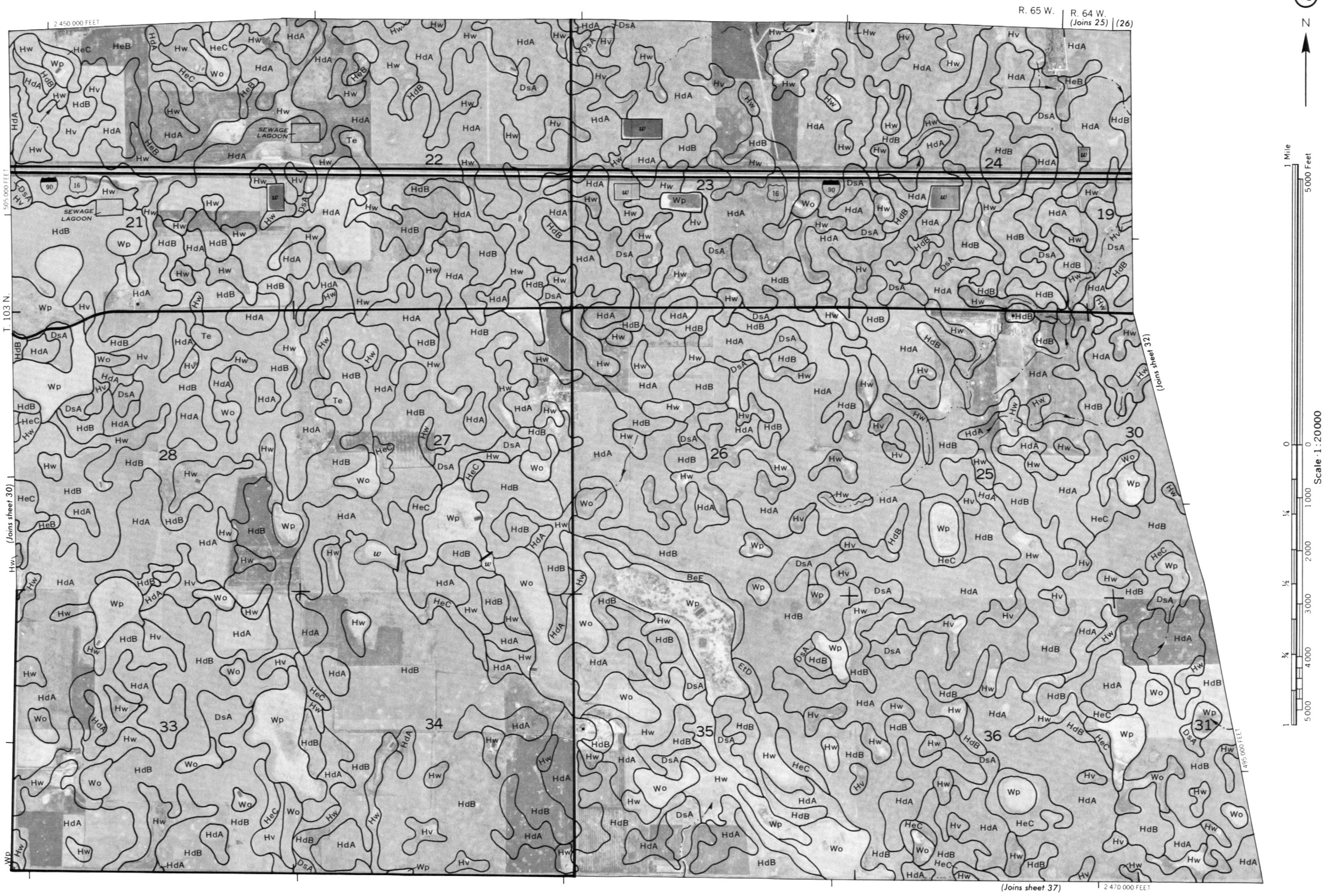


AURORA COUNTY, SOUTH DAKOTA — SHEET NUMBER 29

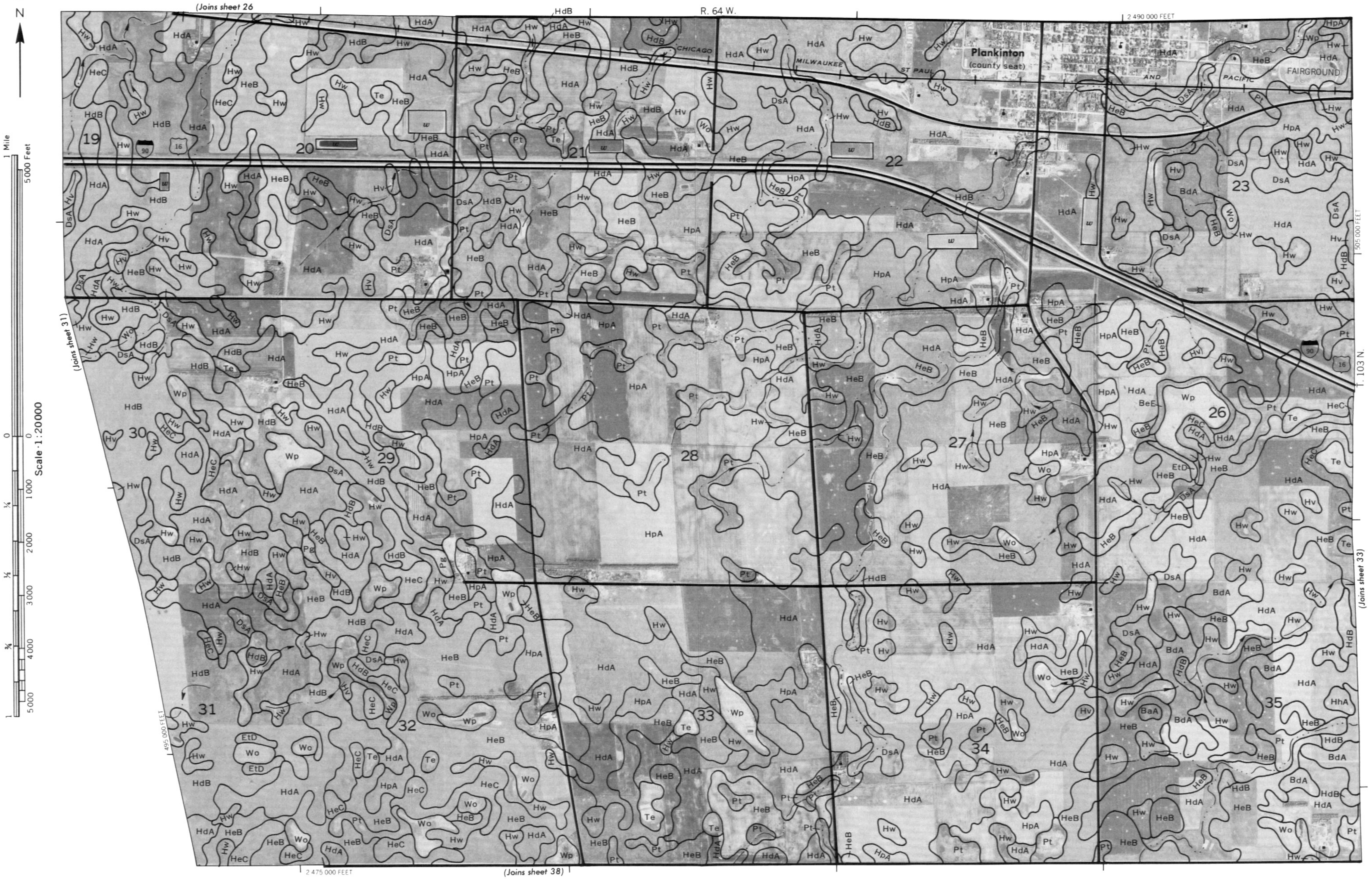


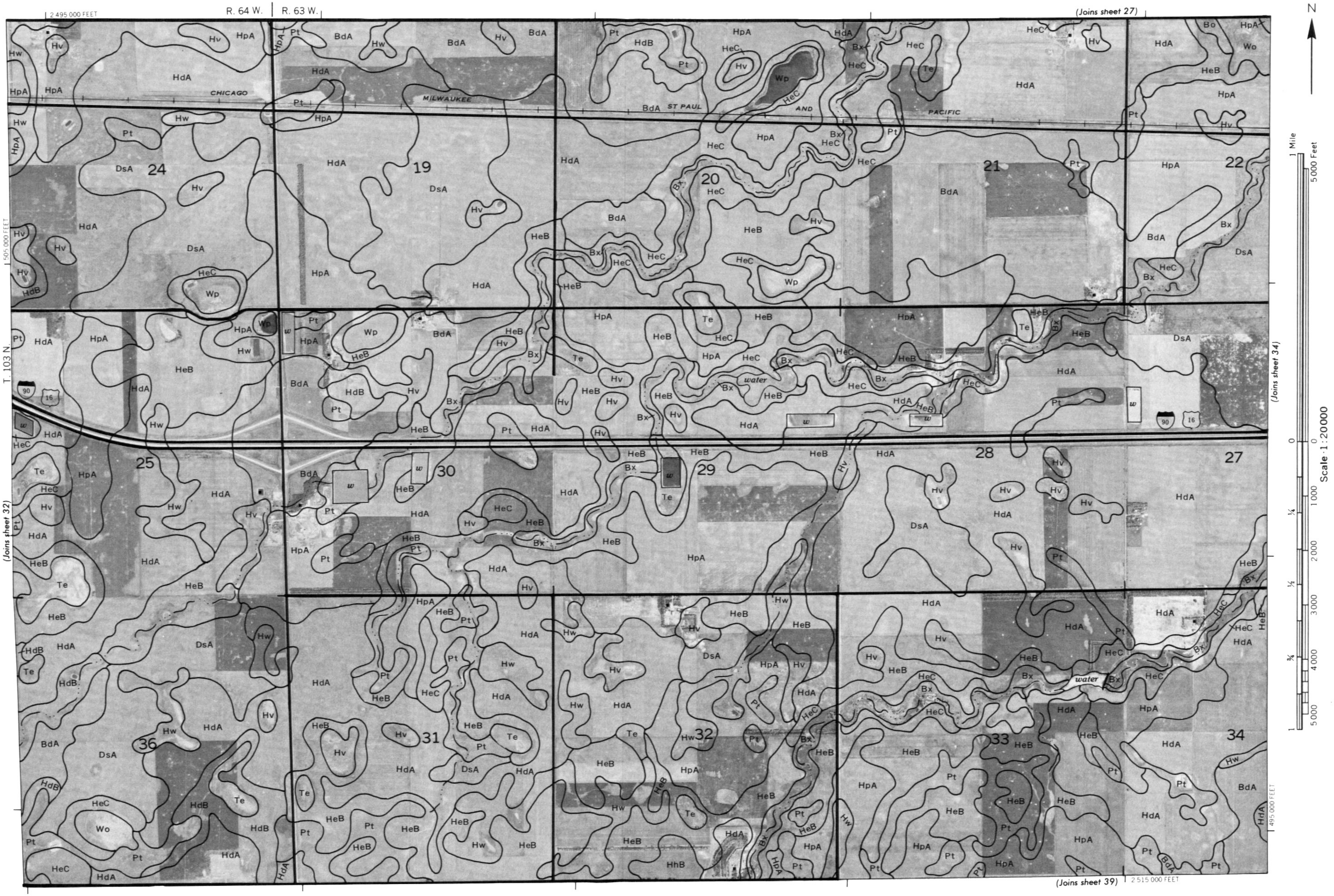
AURORA COUNTY, SOUTH DAKOTA — SHEET NUMBER 30



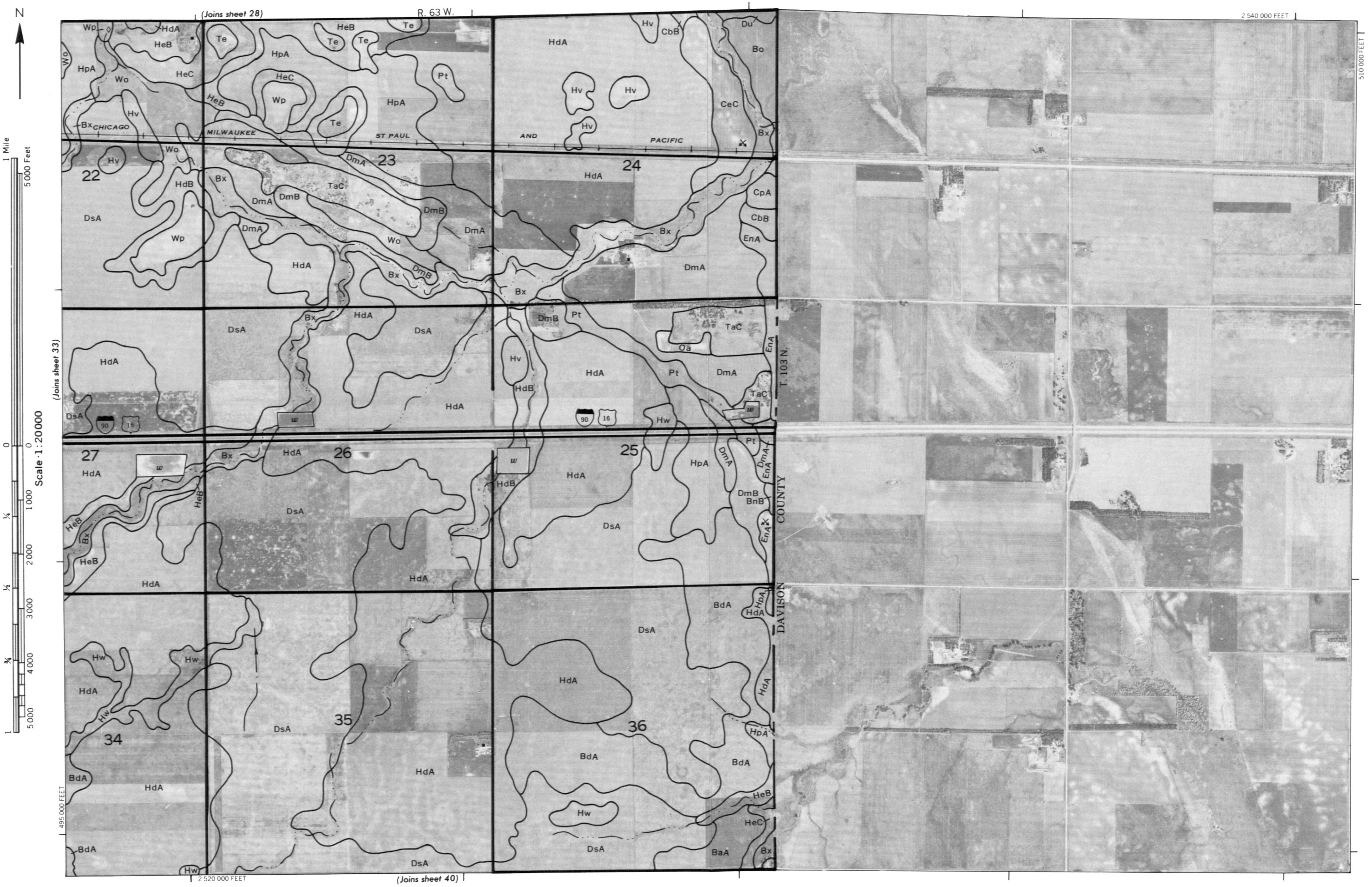

N
R. 65 W.
R. 64 W.
(Joins 25)
(26)
2 450 000 FEET
505 000 FEET
T. 103 N.
(Joins sheet 30)
(Joins sheet 32)
(Joins sheet 37)
2 470 000 FEET
495 000 FEET
SEWAGE LAGOON
SEWAGE LAGOON
90
16
19
21
22
23
24
25
26
27
28
30
31
33
34
35
36
1 Mile
5000 Feet
Scale 1:20000
0
¼
½
¾
1
0
1000
2000
3000
4000
5000

AURORA COUNTY, SOUTH DAKOTA — SHEET NUMBER 32

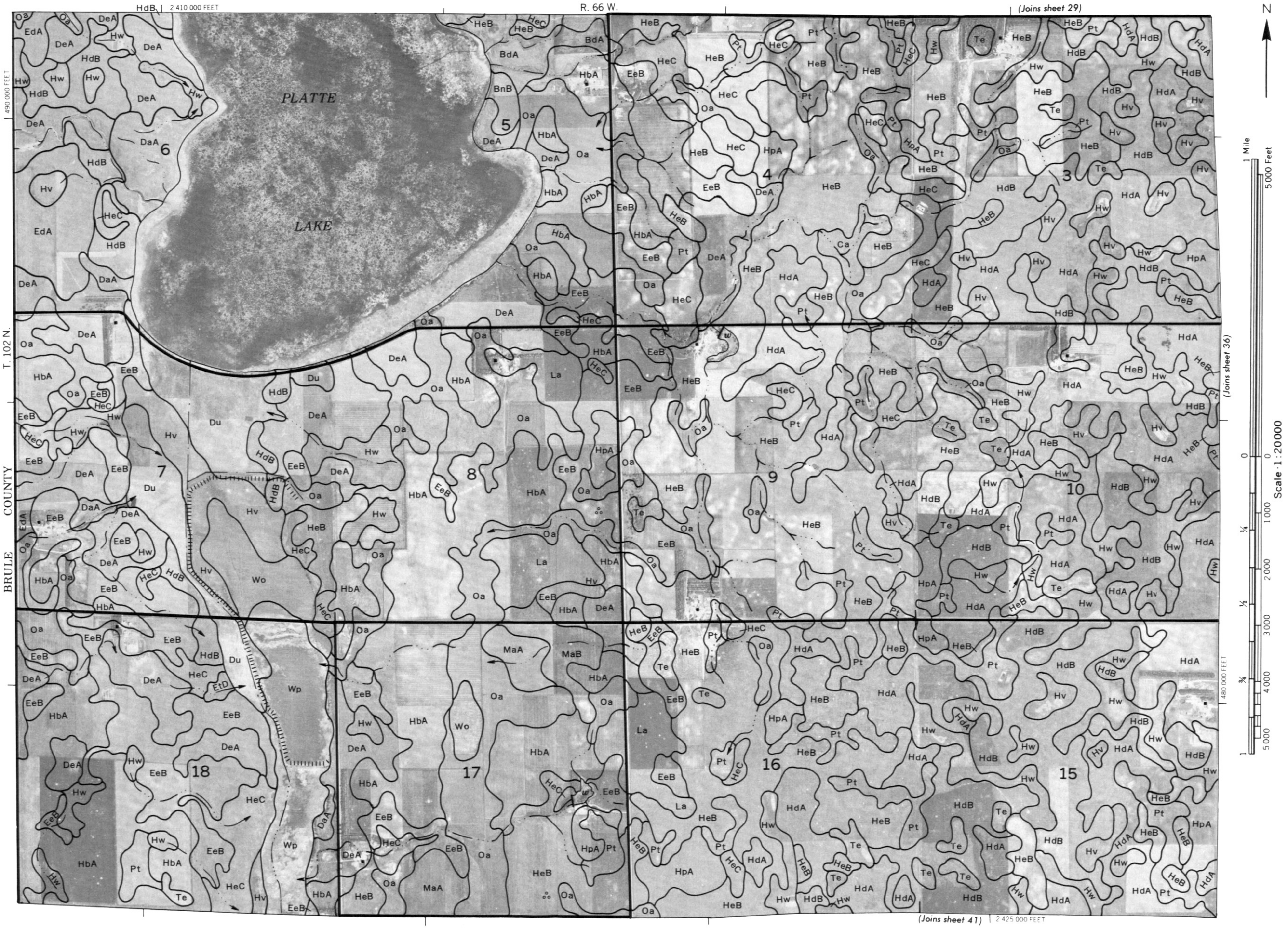



2 495 000 FEET
R. 64 W.
R. 63 W.
(Joins sheet 27)
N
(Joins sheet 34)
(Joins sheet 32)
(Joins sheet 39)
2 515 000 FEET
505 000 FEET
495 000 FEET
T. 103 N.
CHICAGO
MILWAUKEE
ST PAUL
AND
PACIFIC
90
16
19
20
21
22
24
25
27
28
29
30
31
32
33
34
36
water
1 Mile
5000 Feet
0
1000
2000
3000
4000
5000
¼
½
¾
1
Scale 1:20000

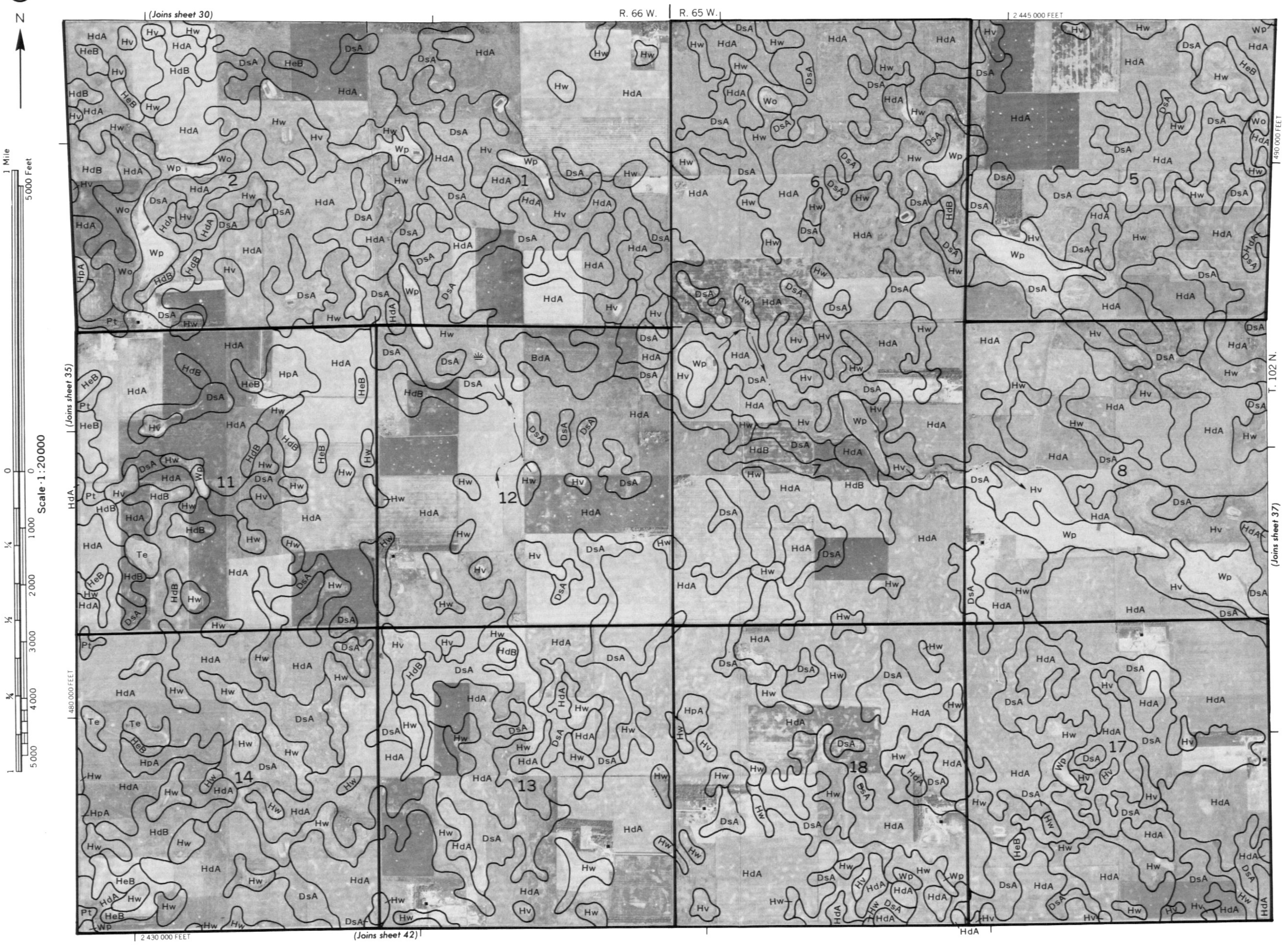
AURORA COUNTY, SOUTH DAKOTA — SHEET NUMBER 34



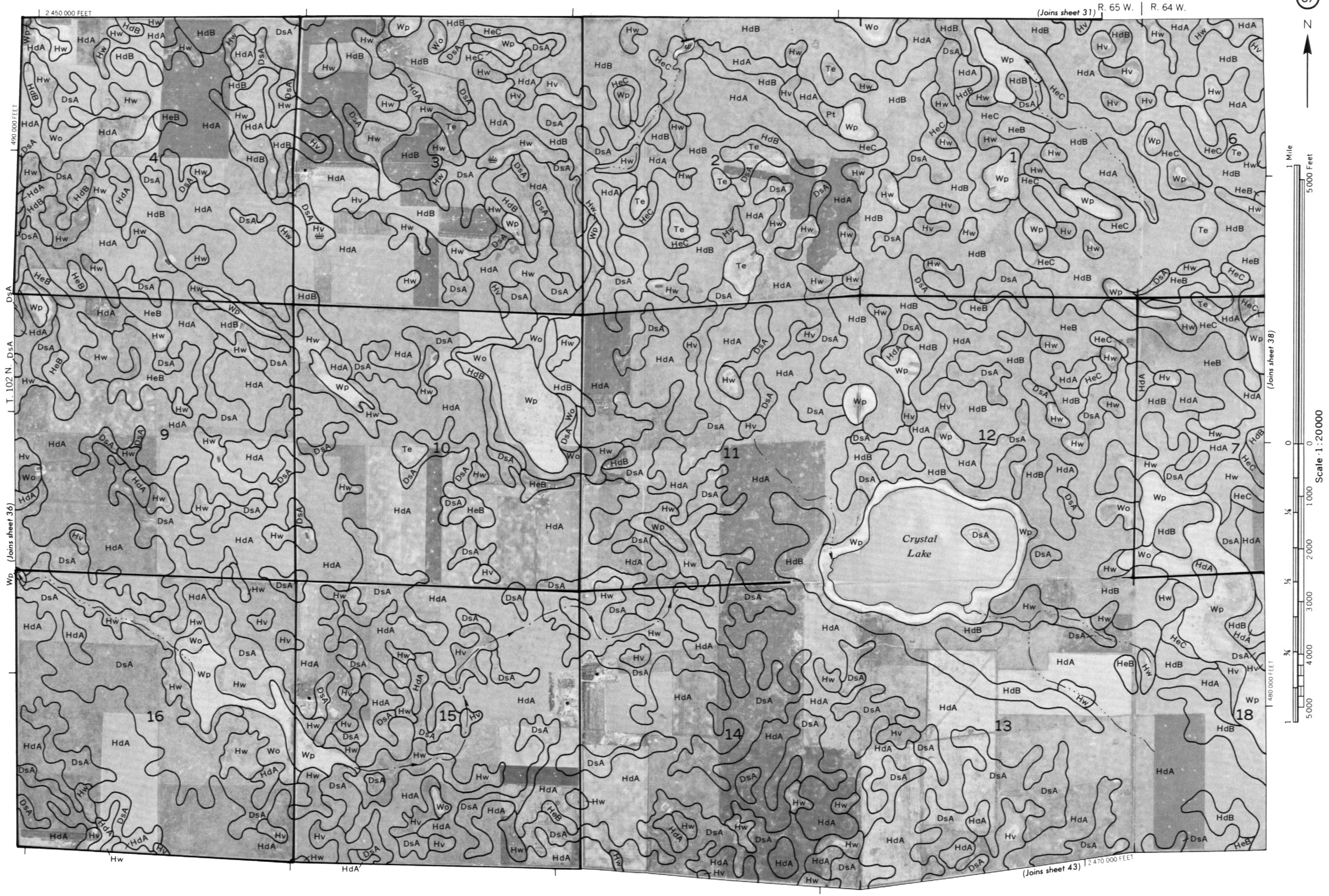
AURORA COUNTY, SOUTH DAKOTA — SHEET NUMBER 35



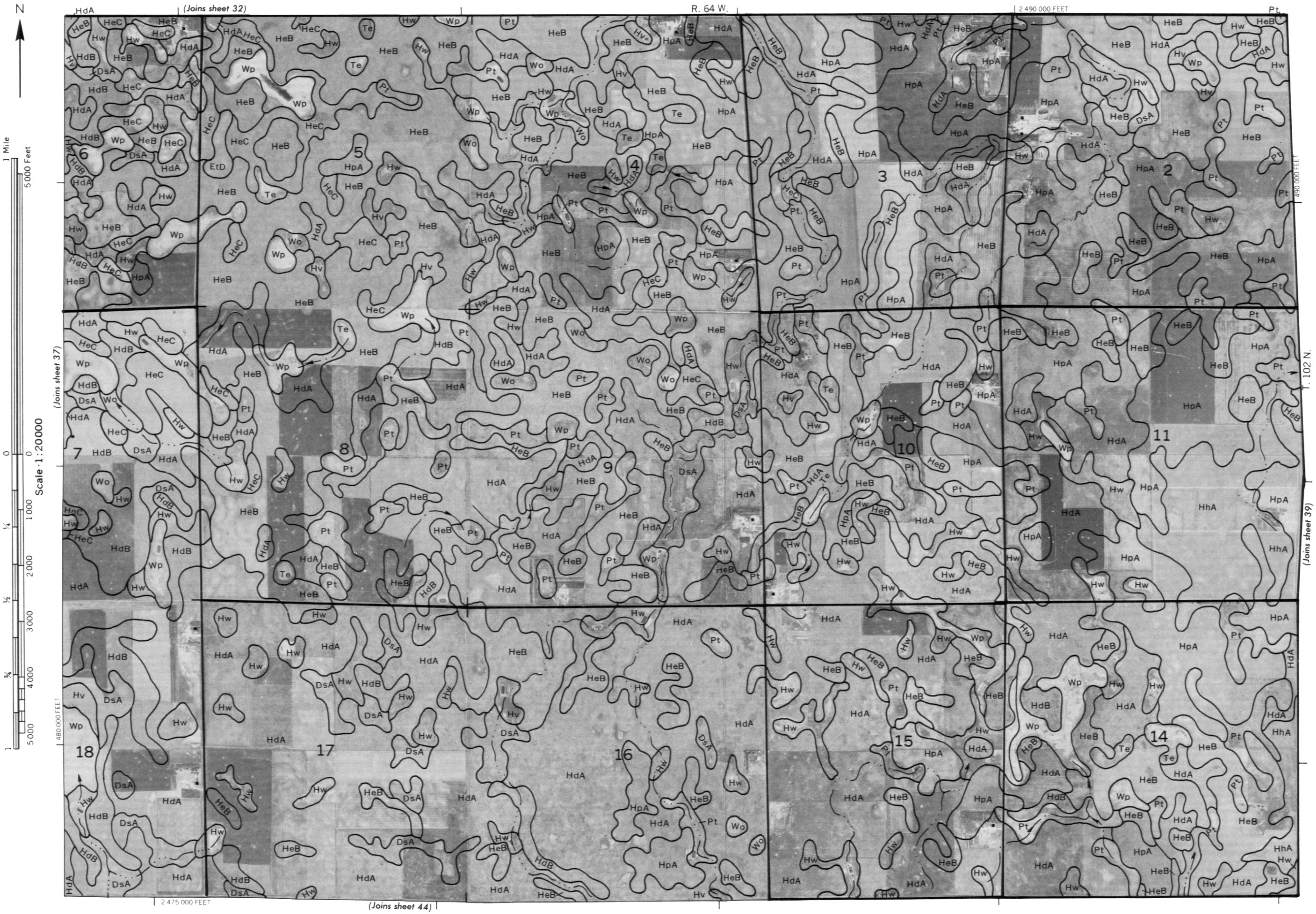
AURORA COUNTY, SOUTH DAKOTA — SHEET NUMBER 36



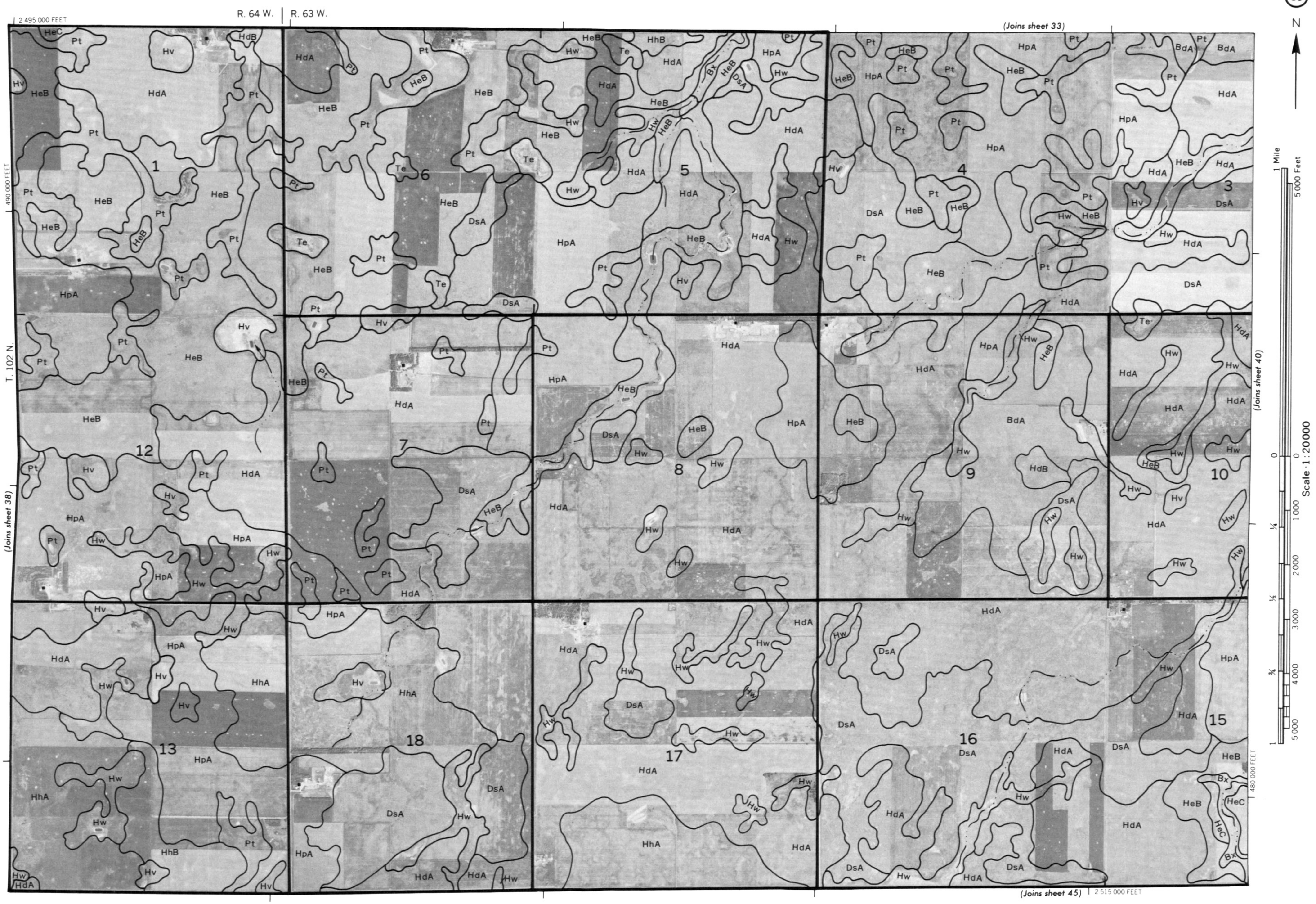
AURORA COUNTY, SOUTH DAKOTA — SHEET NUMBER 37

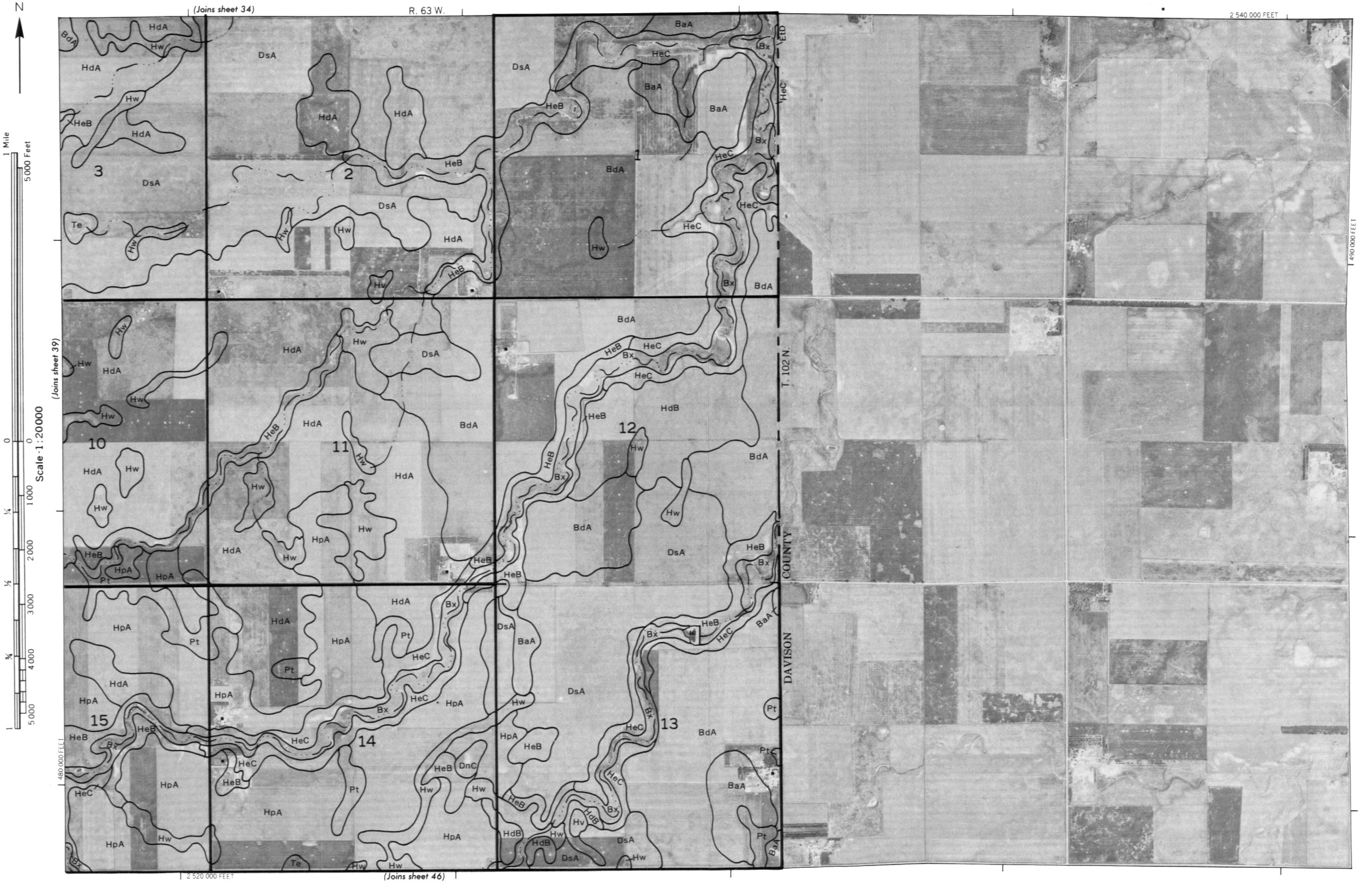


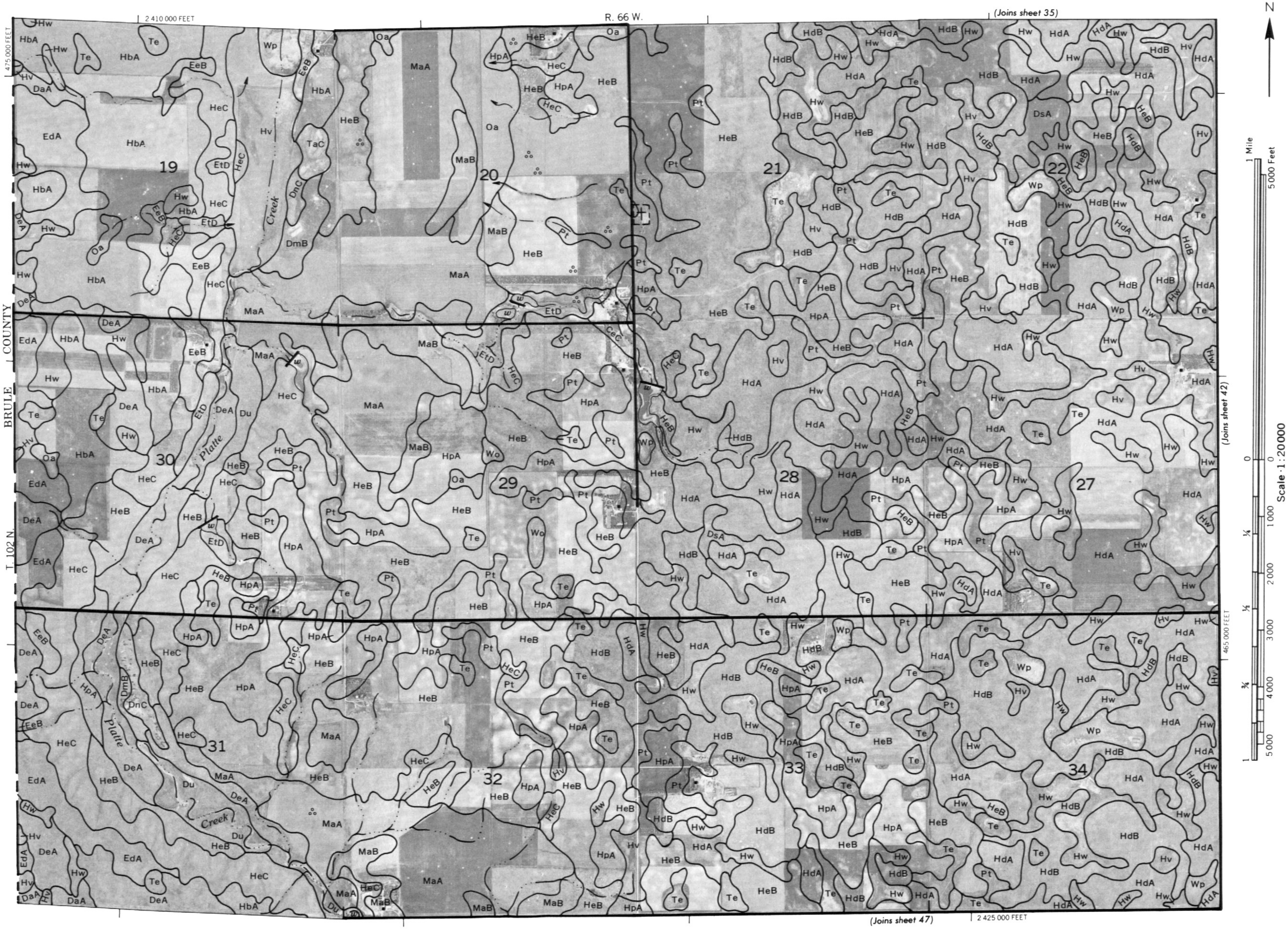
AURORA COUNTY, SOUTH DAKOTA — SHEET NUMBER 38



AURORA COUNTY, SOUTH DAKOTA — SHEET NUMBER 39

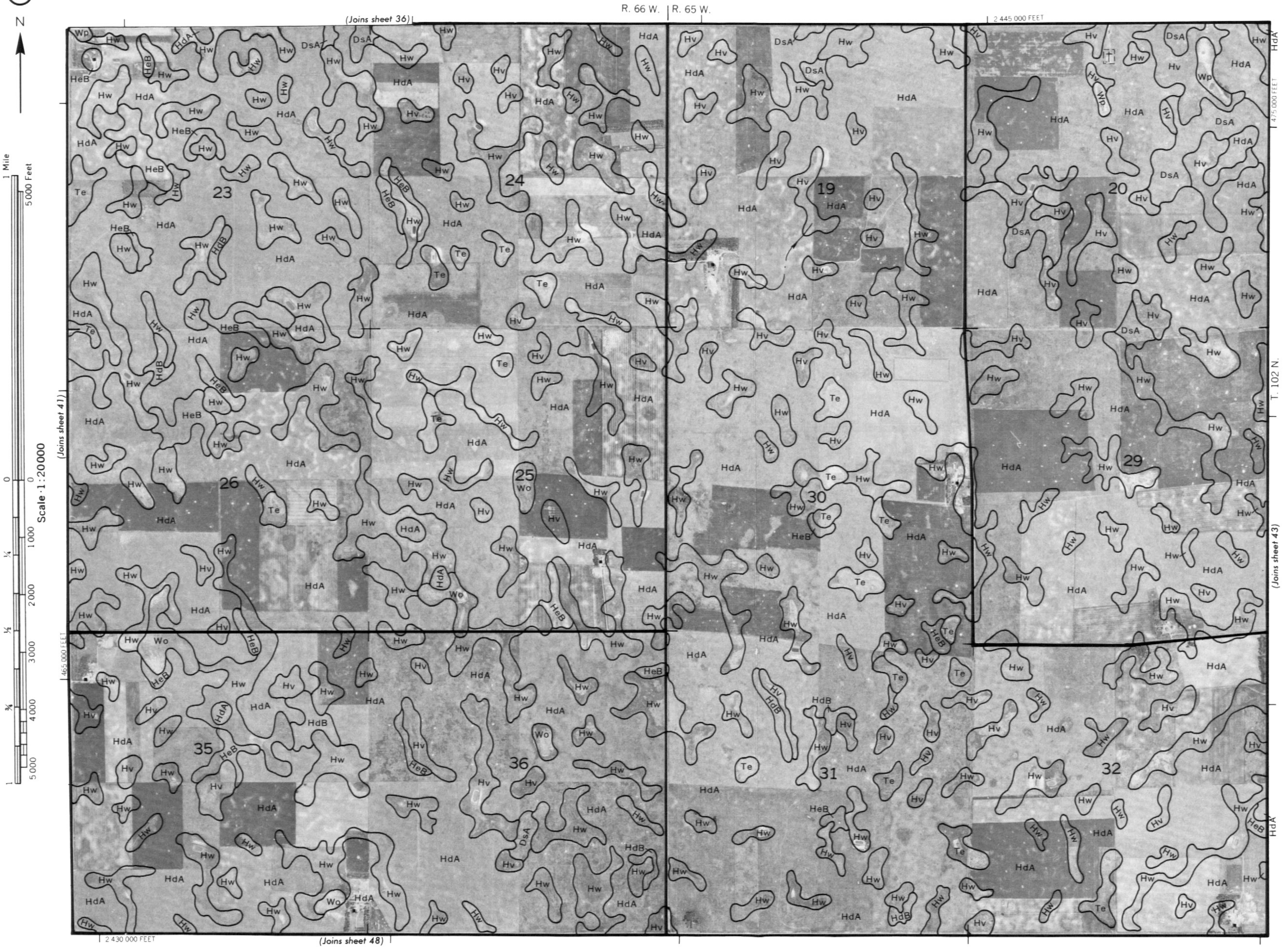



N
1 Mile
5 000 Feet
0
Scale 1:20000
0
1000
2000
3000
4000
5 000
¼
½
¾
1
(Joins sheet 34)
R. 63 W.
2 540 000 FEET
(Joins sheet 39)
490 000 FEET
T. 102 N.
DAVISON COUNTY
ETD
480 000 FEET
2 520 000 FEET
(Joins sheet 46)
1
2
3
10
11
12
13
14
15
BaA
BdA
Bx
DnC
DsA
HdA
HdB
HeB
HeC
Hv
Hw
HpA
Pt
Te

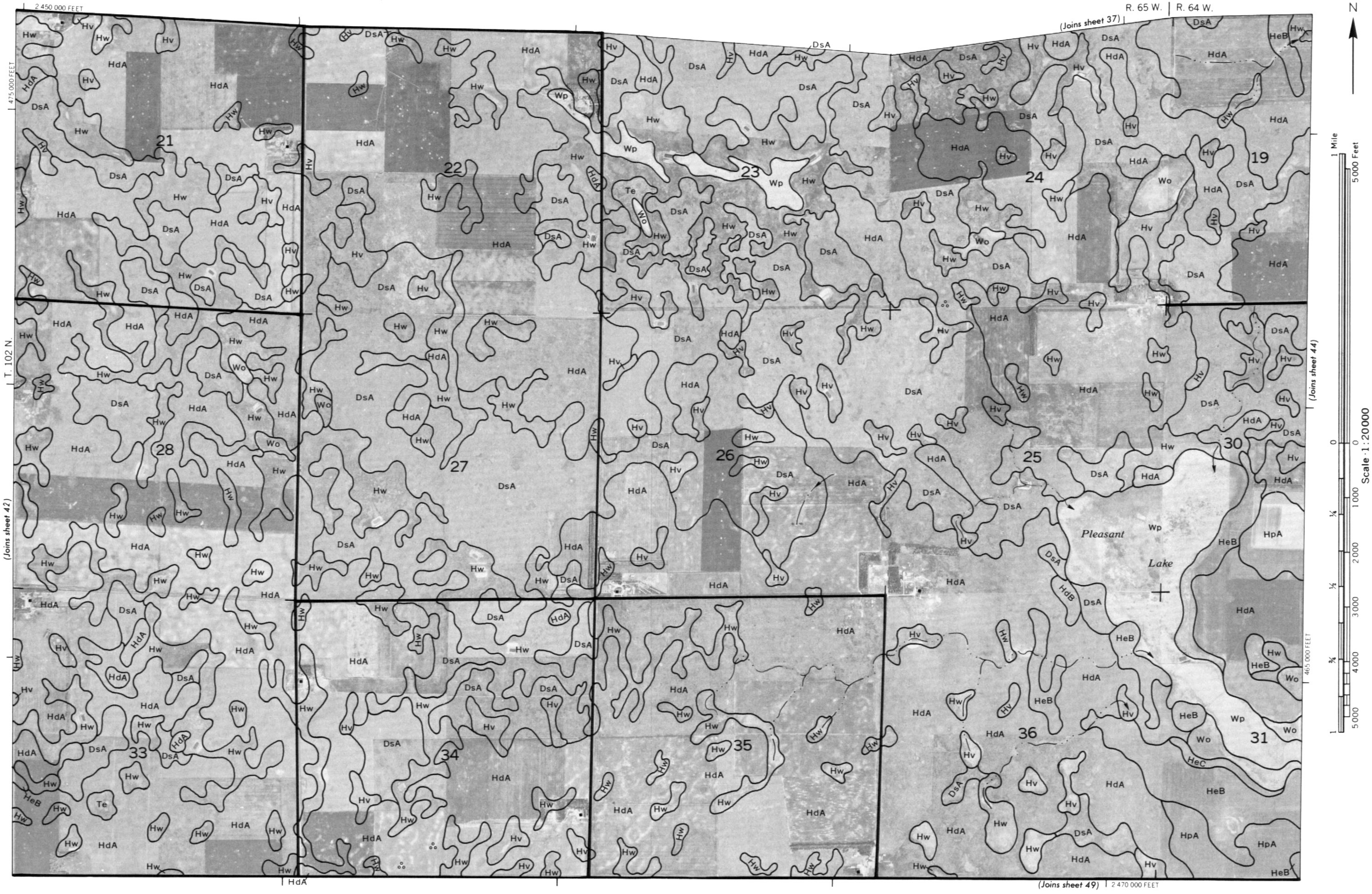

(Joins sheet 35)
R. 66 W.
2 410 000 FEET
475 000 FEET
N
1 Mile
5 000 Feet
Scale 1:20000
0
¼
½
¾
1
0
1000
2000
3000
4000
5000
(Joins sheet 42)
465 000 FEET
BRULE COUNTY
T. 102 N.
19
20
21
22
30
29
28
27
31
32
33
34
Creek
Platte
Platte
Creek
(Joins sheet 47)
2 425 000 FEET

④②

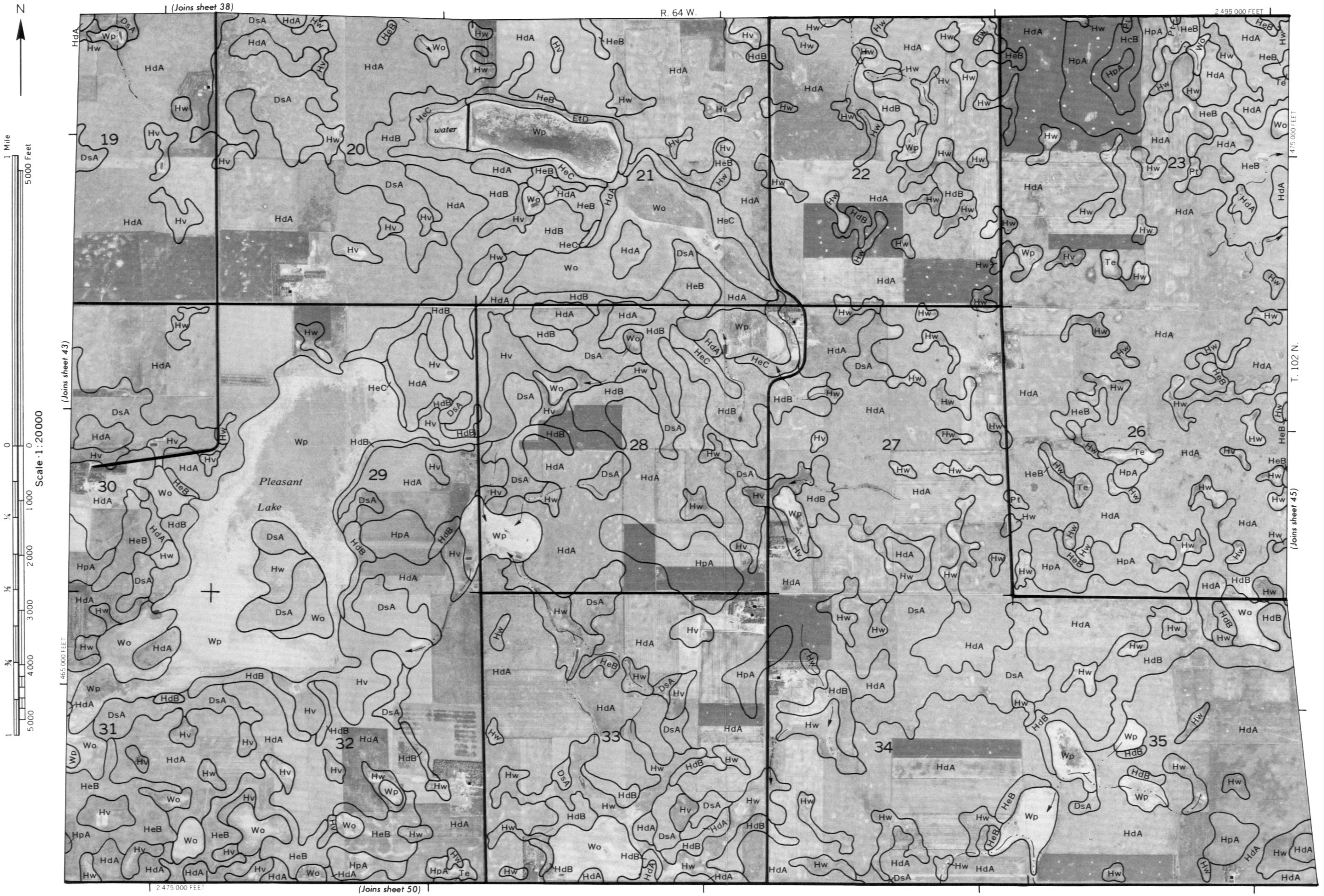
AURORA COUNTY, SOUTH DAKOTA — SHEET NUMBER 42



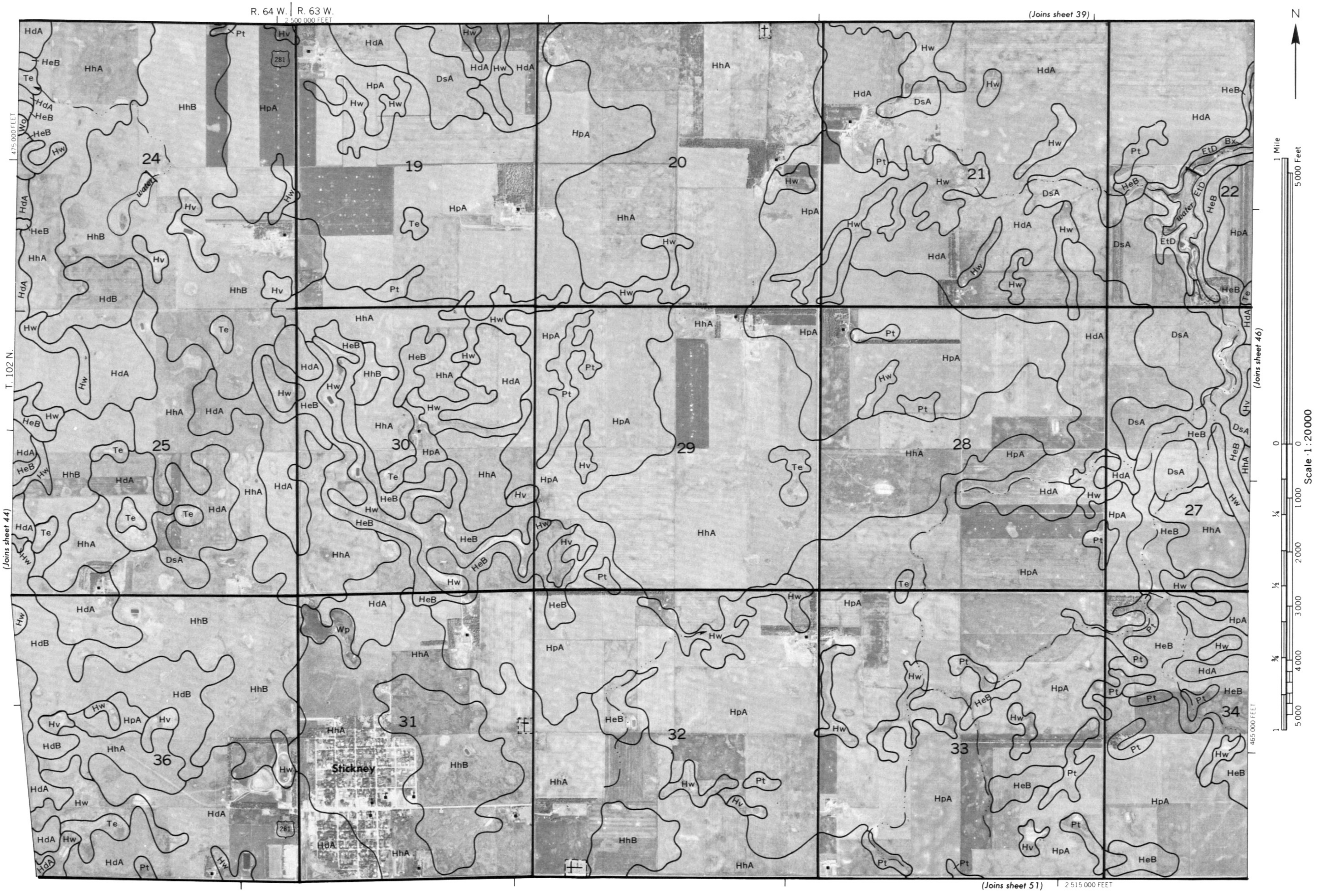
AURORA COUNTY, SOUTH DAKOTA — SHEET NUMBER 43



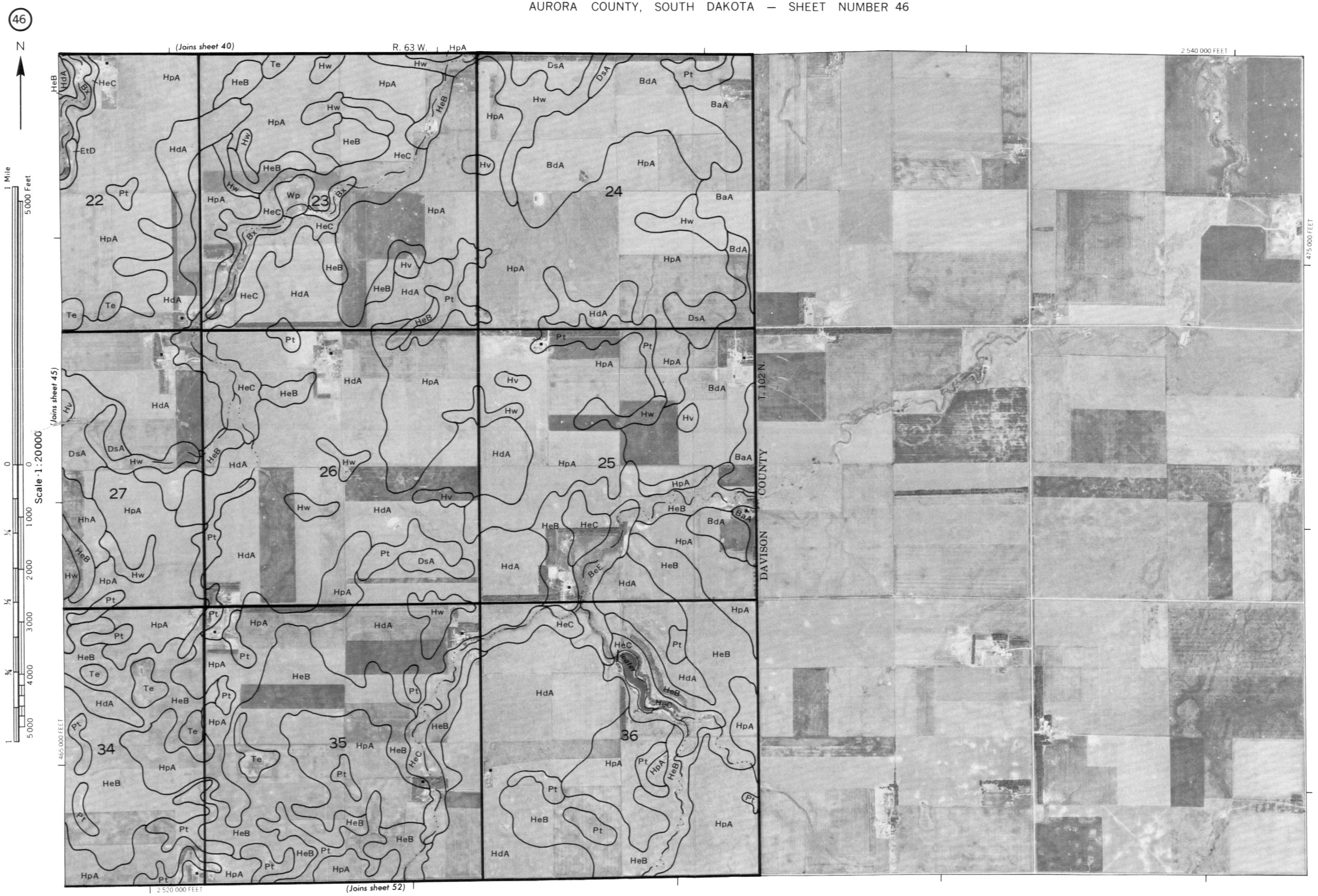
AURORA COUNTY, SOUTH DAKOTA — SHEET NUMBER 44

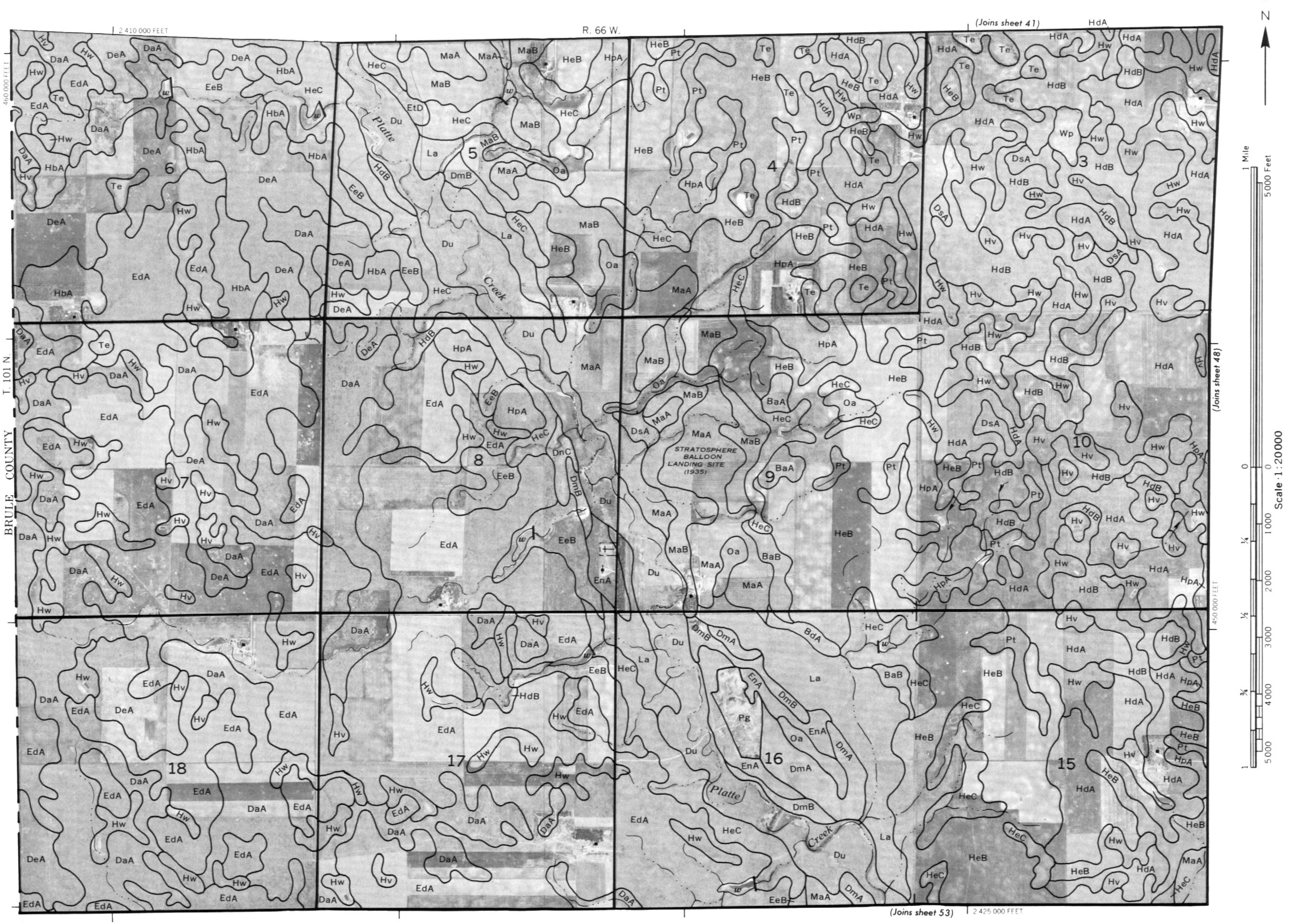


AURORA COUNTY, SOUTH DAKOTA — SHEET NUMBER 45

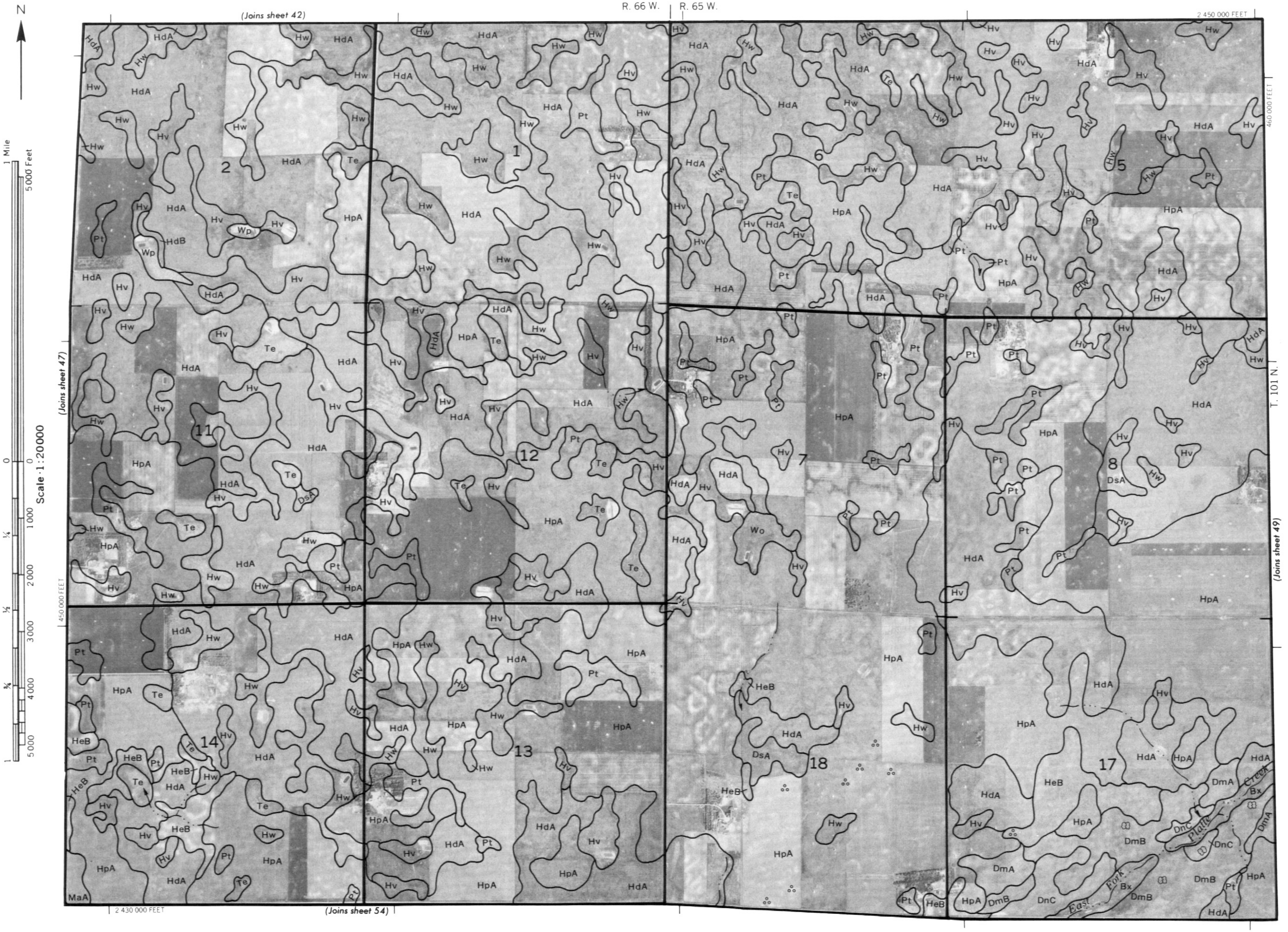


AURORA COUNTY, SOUTH DAKOTA — SHEET NUMBER 46

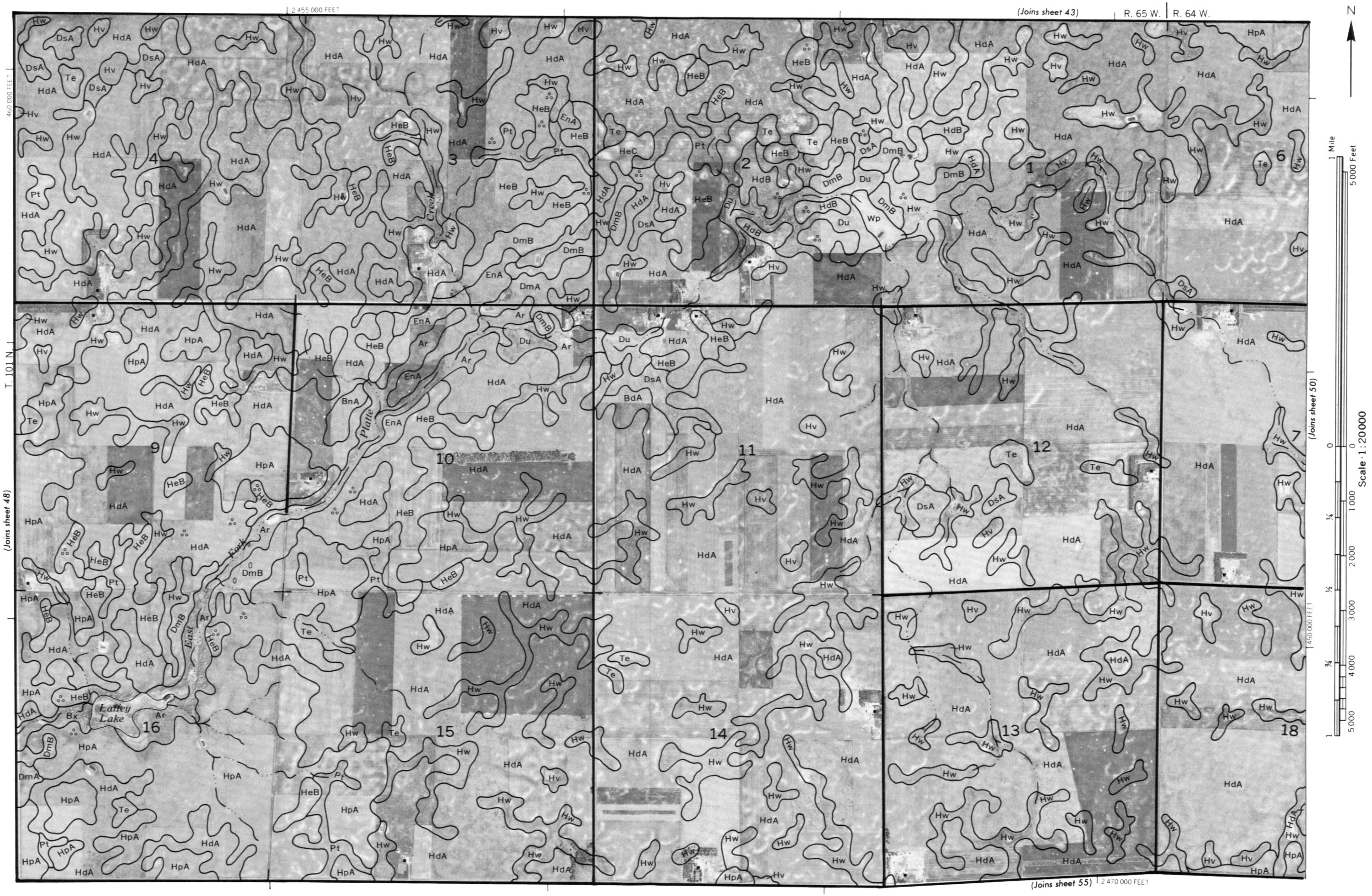


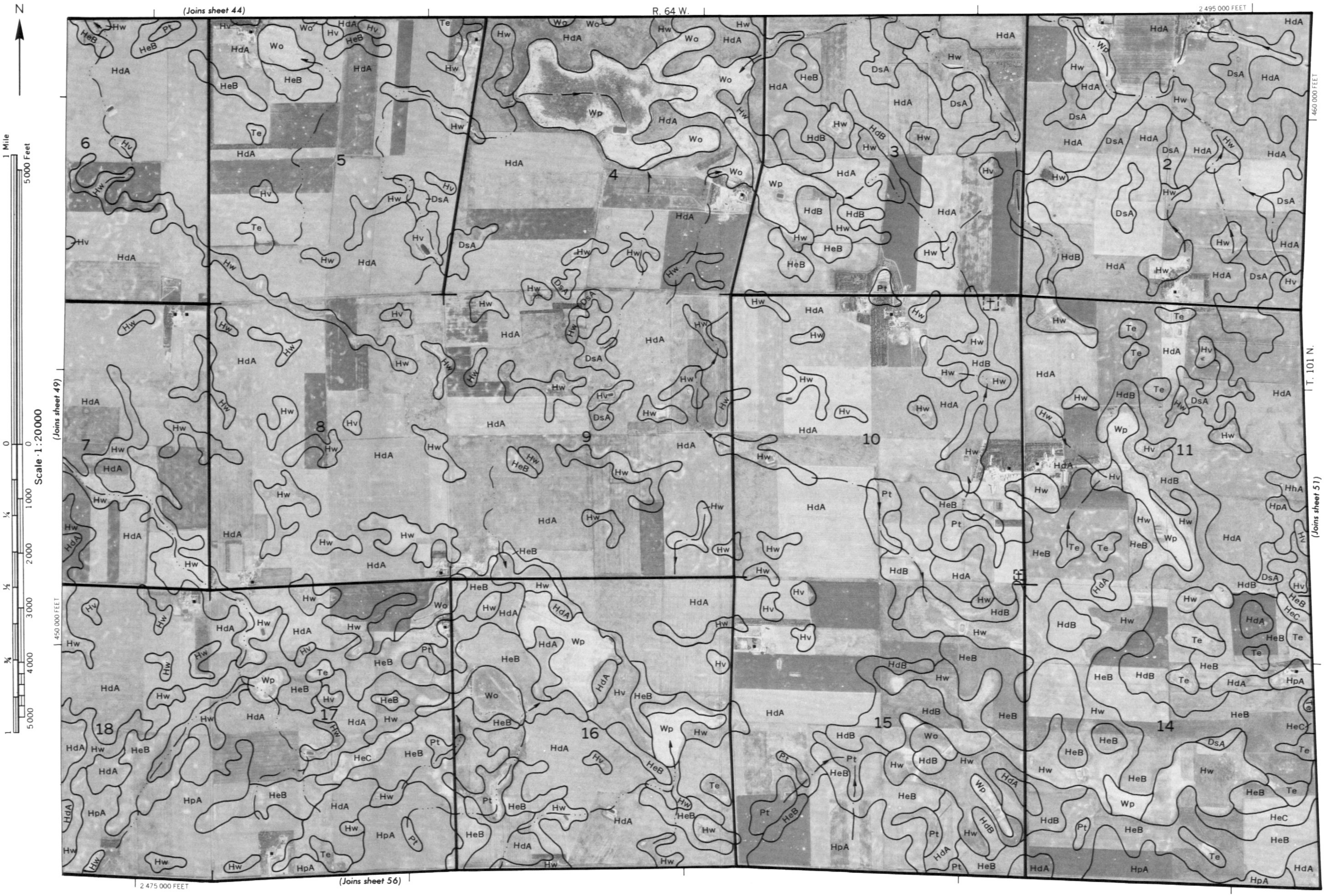

47
N
(Joins sheet 41)
R. 66 W.
2 410 000 FEET
460 000 FEET
T. 101 N.
BRULE COUNTY
(Joins sheet 48)
(Joins sheet 53)
2 425 000 FEET
450 000 FEET
STRATOSPHERE BALLOON LANDING SITE (1935)
Platte Creek
3
4
5
6
7
8
9
10
15
16
17
18
1 Mile
5000 Feet
Scale 1:20000
0
¼
½
¾
1
1000
2000
3000
4000
5000

AURORA COUNTY, SOUTH DAKOTA — SHEET NUMBER 48

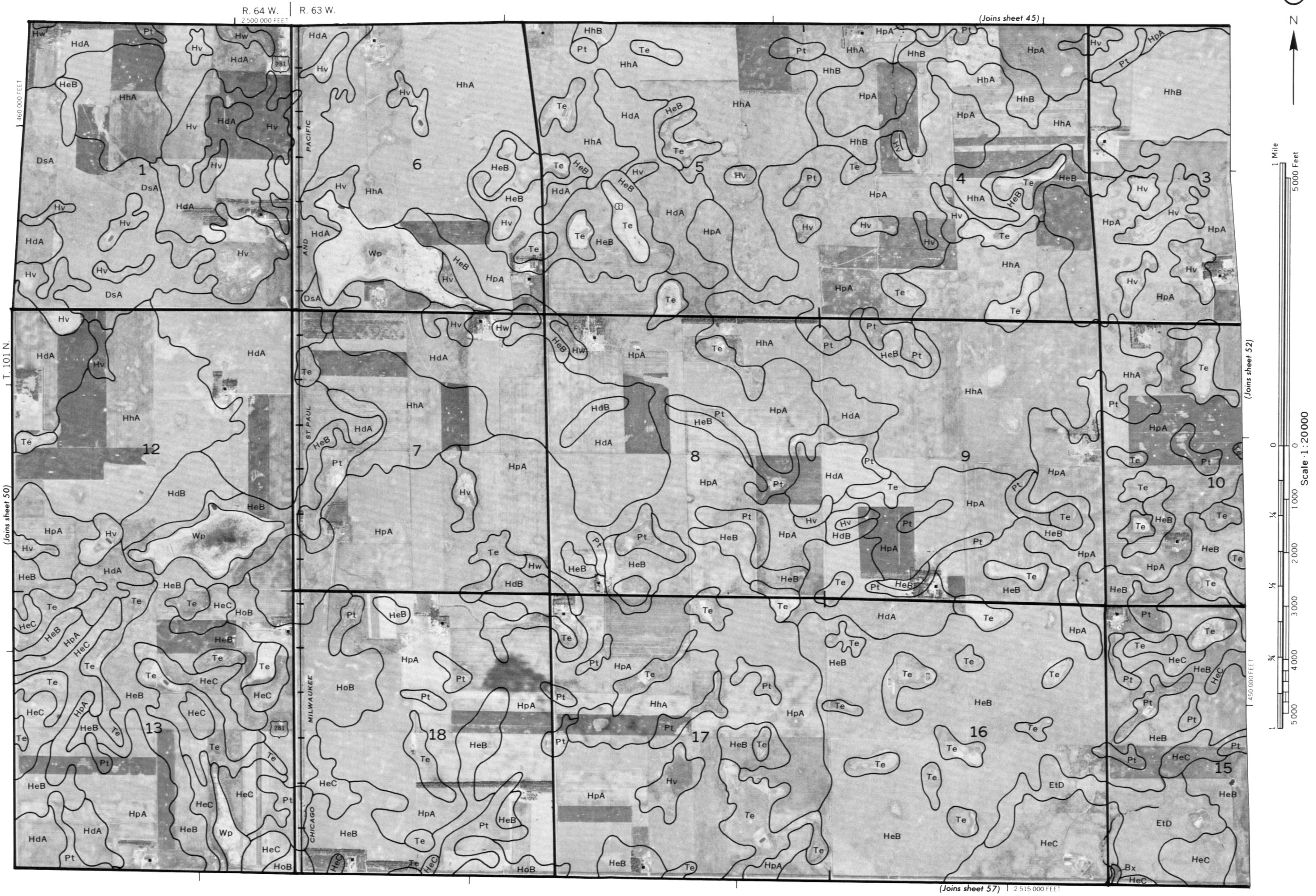


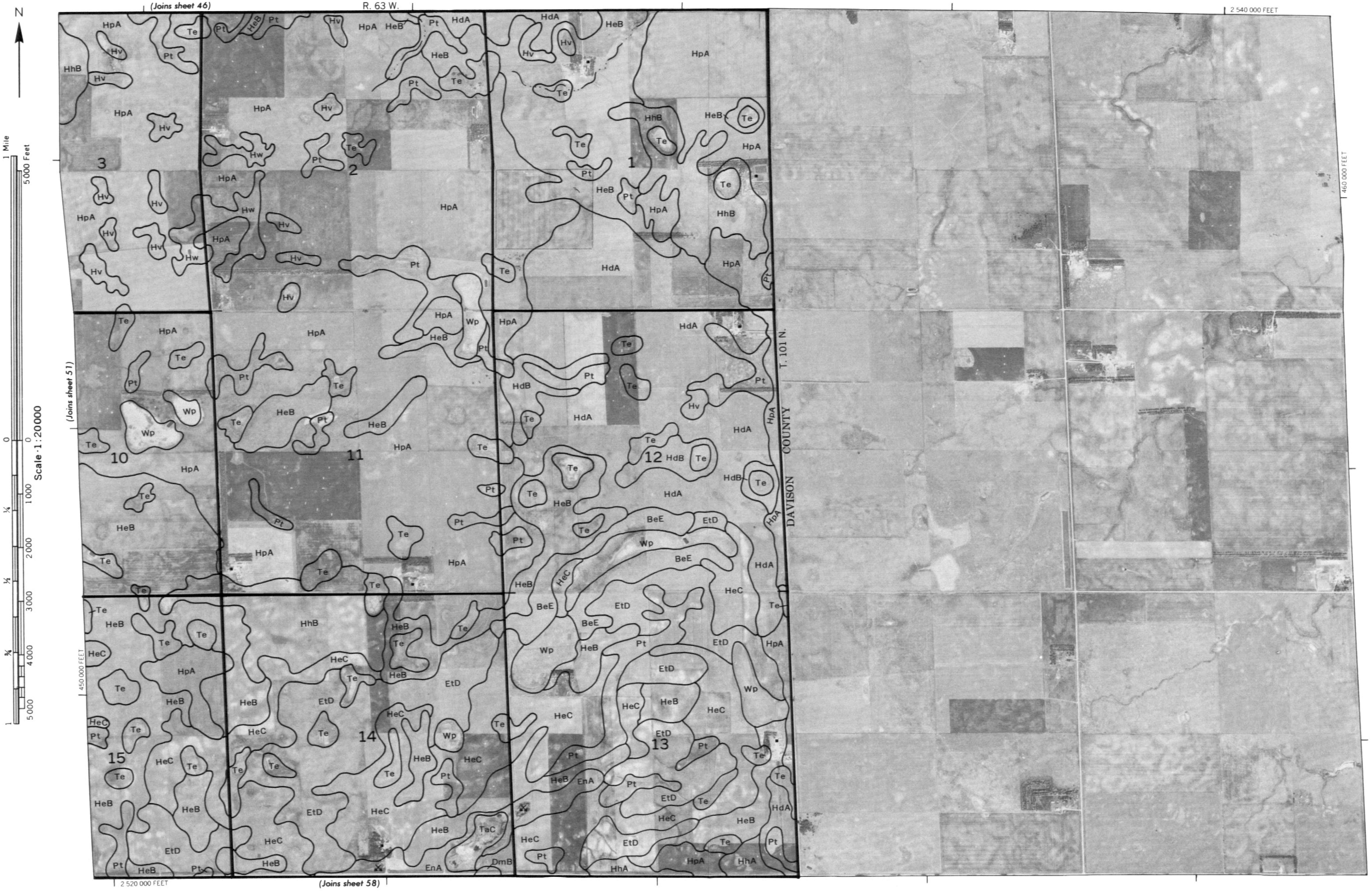
AURORA COUNTY, SOUTH DAKOTA — SHEET NUMBER 49



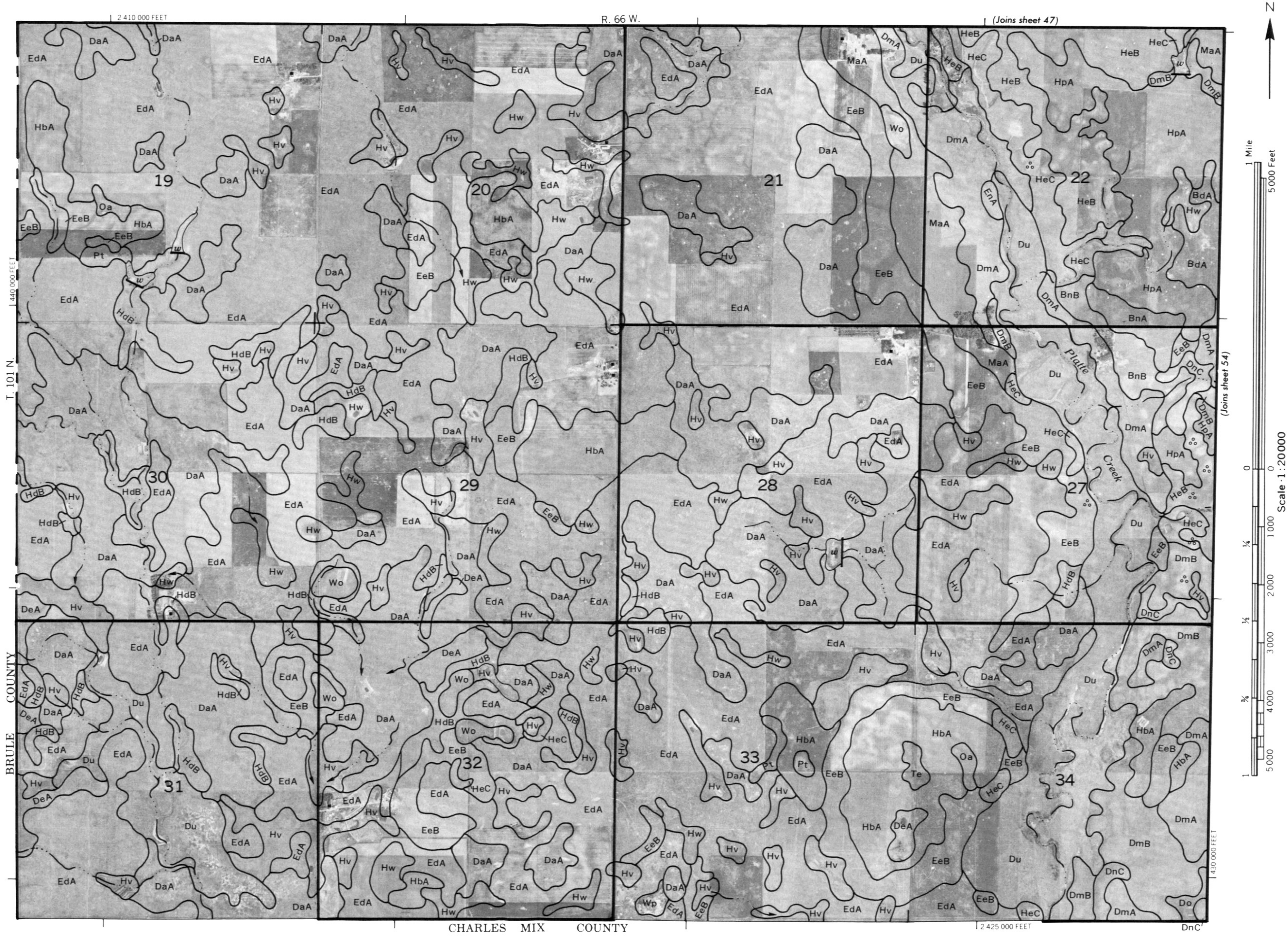

N
(Joins sheet 44)
R. 64 W.
2 495 000 FEET
460 000 FEET
T. 101 N.
(Joins sheet 51)
(Joins sheet 56)
2 475 000 FEET
450 000 FEET
(Joins sheet 49)
1 Mile
5000 Feet
Scale 1:20000
0
1000
2000
3000
4000
5000
¼
½
¾
1
6
5
4
3
2
7
8
9
10
11
18
17
16
15
14

AURORA COUNTY, SOUTH DAKOTA — SHEET NUMBER 51

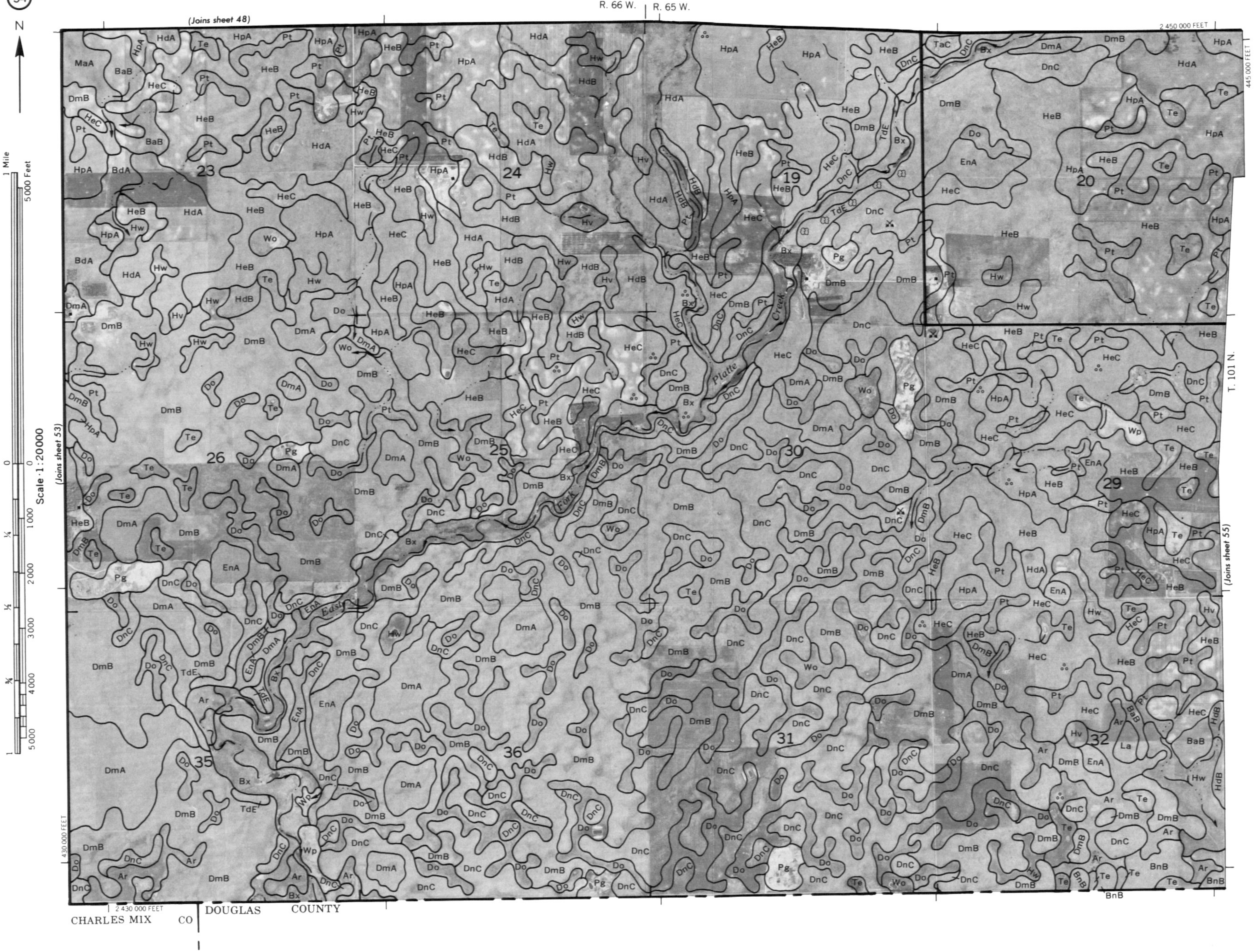



N
(Joins sheet 46)
R. 63 W.
2 540 000 FEET
460 000 FEET
(Joins sheet 51)
T. 101 N.
DAVISON COUNTY
450 000 FEET
2 520 000 FEET
(Joins sheet 58)
1 Mile
5000 Feet
0
1000
2000
3000
4000
5000
¼
½
¾
1
Scale 1:20000
1
2
3
10
11
12
13
14
15

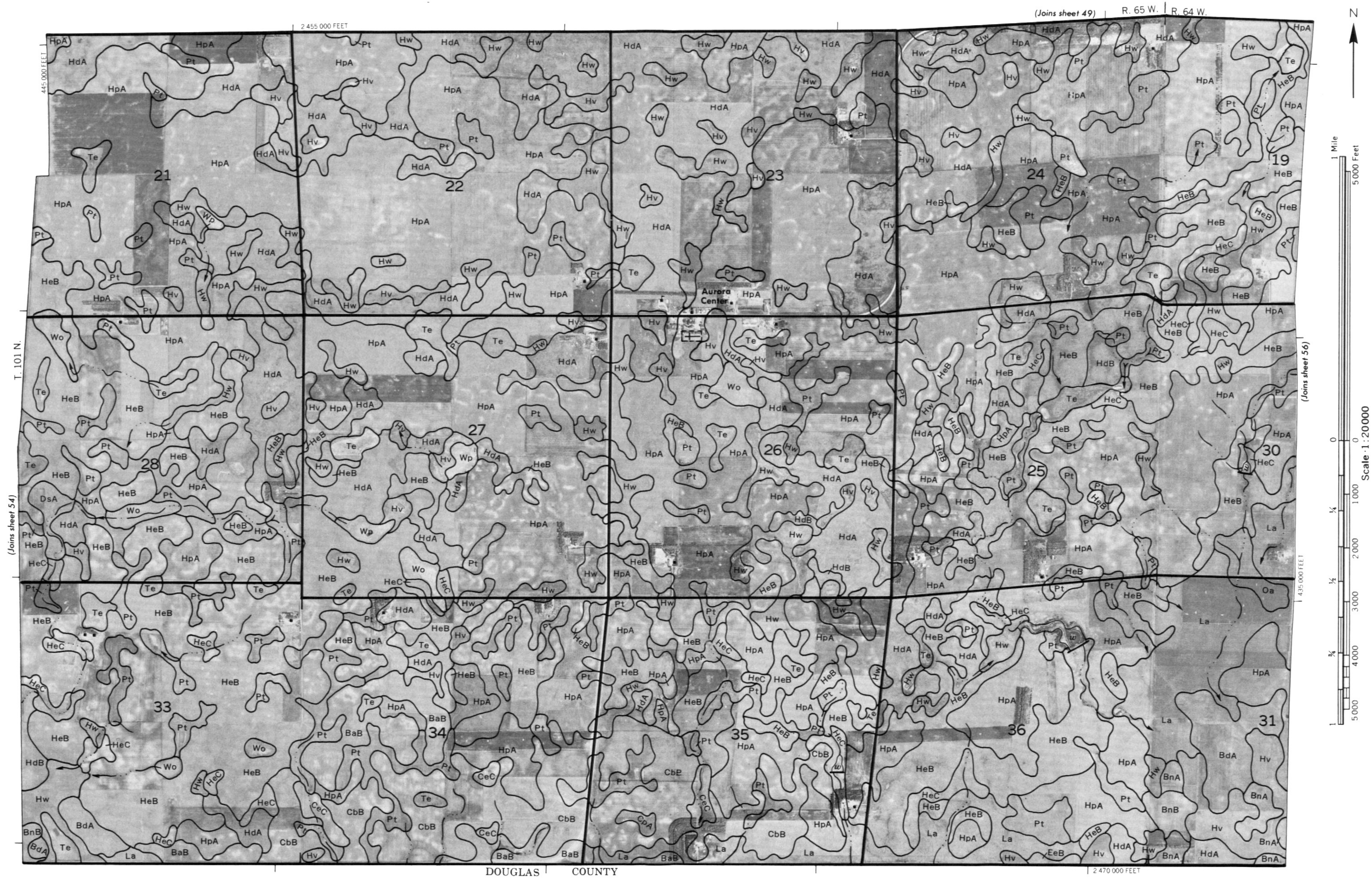
AURORA COUNTY, SOUTH DAKOTA — SHEET NUMBER 53



AURORA COUNTY, SOUTH DAKOTA — SHEET NUMBER 54

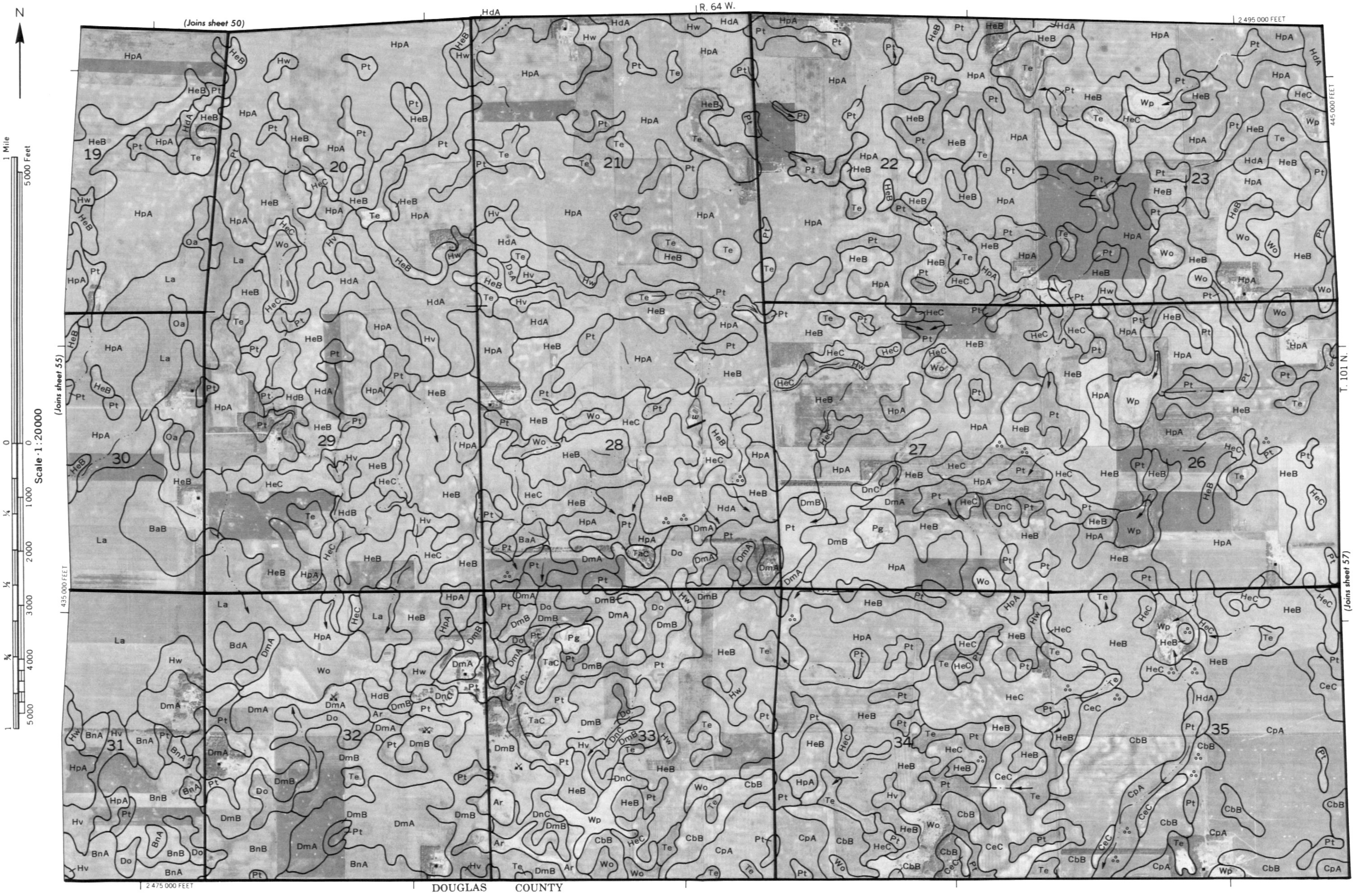


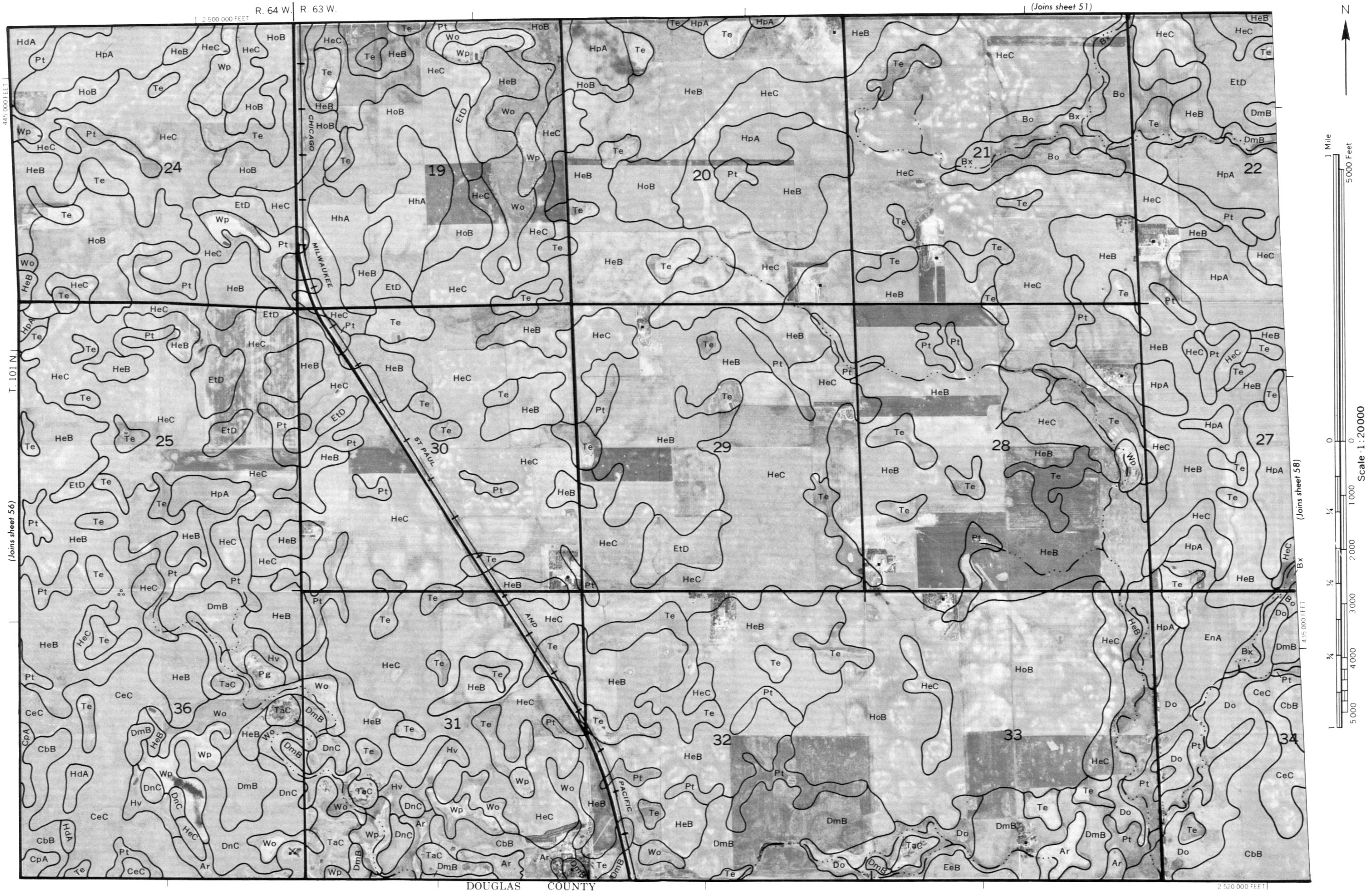
AURORA COUNTY, SOUTH DAKOTA — SHEET NUMBER 55



56

AURORA COUNTY, SOUTH DAKOTA — SHEET NUMBER 56




R. 64 W.
R. 63 W.
(Joins sheet 51)
(Joins sheet 56)
(Joins sheet 58)
T. 101 N.
2 500 000 FEET
445 000 FEET
435 000 FEET
2 520 000 FEET
N
CHICAGO
MILWAUKEE
ST PAUL
AND
PACIFIC
DOUGLAS COUNTY
19
20
21
22
24
25
27
28
29
30
31
32
33
34
36
1 Mile
5000 Feet
Scale 1:20000
0
¼
½
¾
1
1000
2000
3000
4000
5000
HeB
HeC
HoB
HpA
Te
Pt
Wo
Wp
EtD
HhA
DmB
DnC
CeC
CbB
CpA
HdA
TaC
Hv
Pg
Ar
Bo
Bx
Do
EnA
EeB

AURORA COUNTY, SOUTH DAKOTA — SHEET NUMBER 58